ILLUMINATING ENGINEERING

FEBRUARY 1955

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Report on Lighting Progress

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

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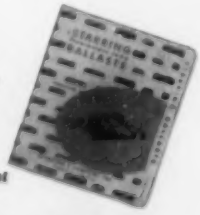

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

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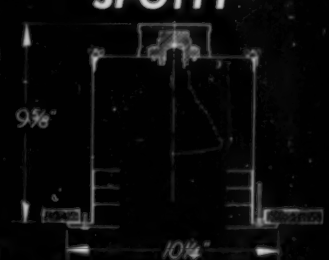

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Lighting Progress in 1953-1954

Prepared by the Committee on Progress of the Illuminating Engineering Society

FOR Light's Diamond Jubilee, it was fitting that a presentation of Lighting Progress feature highlights not only of the past 12 months, but of man's progress in lighting from our earliest knowledge. Especially did it seem fitting to emphasize Edison's developments and the birth of the electrical age.

As presented at the National Technical Conference, the Report on Lighting Progress looked into the past some 50,000 years when man first learned to use fire, both for survival and for extending his working hours — with light. Perhaps it is not too far-fetched to conclude that the use of flame for light was man's earliest engineering feat — and illuminating engineering as a consequence the first engineering.

Flame sources, Light's History shows, changed only in fuel and method of application for all those thousands of years — until Edison, in 1879. Burning wood advanced to burning animal fat, to tallow and wax, and then to oil and lastly gas. All of the developments in electric lighting as we know it have been in the past 75 years.

A summation of this 75 years of progress shows some astonishing advances. Today some 2500 thousand billion lumen-hours of man-made light are used in the United States. That's over 15 million lumen-hours for each of the 150 million Americans — equal to light from two 40-watt fluorescent lamps or two 150-watt filament lamps, burning 12 hours per day the year round, for every man, woman and child in the United States.

These circumstances have paid off in production achievements. With five per cent of the world's population, America produces 45 per cent of the world's goods. No small part of this is due to dependable, round the clock lighting. This year, more than ever, industry has shown an appreciation of the value to production in good lighting. Its principles are applied to factories, new and old, in ever increasing numbers. The demand for equipments which provide it is ever more noticeable.

In today's light-conscious world, people are apt to think that a store is closed if its lights are not bright enough to compete with daylight. High levels of carefully applied illumination are somehow associated with confidence in the merchandise, in the minds of the purchasing public.

Street lighting systems throughout the country are not only vastly more extensive, but are lighted to higher levels. The year 1954 saw over 1800 miles of mercury street lighting installed — an increase of 80 per cent over the previous year.

School lighting stands near the top in public interest. Enormous increases in the school population, with more to come, have resulted in a greater expansion of national school lighting equipment than in any other year.

Home lighting, of course, is of widest interest. Growth in this field was especially extensive during 1954. A new interest in garden lighting was evidenced during the year, and a demand for installations to be lived with outdoors, or to be viewed with comfort from inside the house. Increased interest was also shown in extending the usefulness of other house areas — playrooms in the cellar for instance — and in using lighting techniques for decorative as well as functional purposes in the home.

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A report presented at the National Technical Conference of the Illuminating Engineering Society, Atlantic City, N. J., September 14-17, 1954. Approved by the Council of I.E.S. February 1955.

Progress in . . .

Light Sources

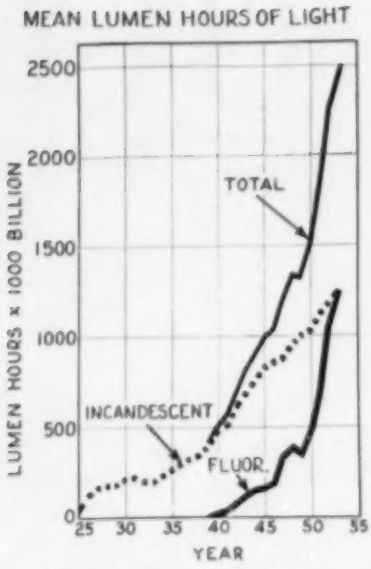


Figure 1. The use of light in the United States has almost tripled in ten years.

Fluorescent

During 1954 fluorescent lamps continued their leadership. They now produce more total lumen hours than any other type of light source. Notable advances were made this year toward the goal of improving the efficiency and beauty of light from fluorescent lamps, and reducing the cost of maintaining lighting systems in which they are used.

Most significant of the new fluorescent lamps this year is a high output rapid-start lamp producing one-third more light than any previous fluorescent lamp, and without sacrifice of efficiency. Originally announced as a 110-watt source, the lamp was subsequently improved so the wattage consumption is now only 100, with no decrease in lumen output. The lamp current is 800-815 milliamperes, and a new double-contact recessed base is employed.

The high output rapid-start lamp fills a long-felt need. It will permit increased illumination levels where the number of lighting units to be installed must be limited, or where the lamps must operate in low temperatures. For general interior lighting, the improved high output lamp gives lower overall lighting costs than the 96T12 slimline in many types of luminaires. Of course, the higher brightness calls for additional attention to shielding for proper visual comfort and satisfactory reflectance in tasks having glossy surfaces. Luminaire ventilation is also important.

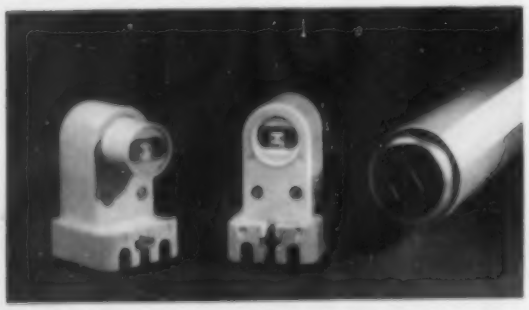


Figure 2. The 8-foot high-output fluorescent lamp announced in 1954 uses a new double-contact recessed base, shown here with a set of lampholders.

In 1954, the 40-watt rapid-start lamp became the type most widely used for new installations of four-foot units; this lamp is now made with welded base pins, assuring a more positive electrical contact than with soldered pins.

Growing public use of deluxe cool white and warm white fluorescent lamps is noted during the past year; all three sizes of circline lamps are now available with these improved color rendition phosphors. Requests for such lamps had been numerous, but it remained for development scientists to solve the problem of color distortion when the coated tubes were reheated to be bent into the circular shape. Also introduced this year were 40-watt and 96-inch T-12 deluxe cool white fluorescent lamps having higher outputs of deep red light than emitted by present deluxe lamps. The new lamps provide somewhat improved color rendition at some sacrifice in efficiency.

During the first year after introduction of the thyratron dimming circuit, over 50 installations have been completed. Two simplified dimming circuits have appeared recently for applications where lower cost is desirable and the extra advantages of the thyratron dimmer are not required. Both of the simplified circuits use a modified single-lamp 40-watt rapid-start ballast.

Interest in high-frequency operation of fluores-

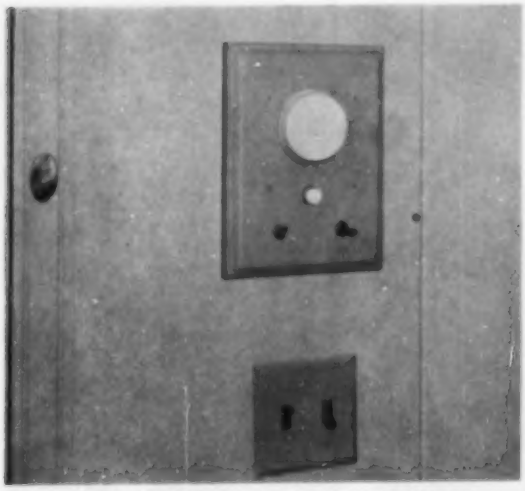


Figure 3. The brightness selector for a simplified fluorescent dimming installation. Manually operated variable inductance gives a 100 to 1 dimming range.

cent lamps is increasing. Two types of conversion equipment are now commercially available: 60 and 360-cycle magnetic frequency multipliers in the 5 kilowatt size for special lighting applications, and 60 to 400 cycle package-unit rotary converters in several sizes up to 30 kilowatts. An installation of the latter equipment for 600 milliampere operation of 96-inch T-12 slimline lamps is now being made in the Union College Field House at Schenectady. The high frequency system reduced the weight of the luminaires by over 50 per cent. Further, there resulted a higher illumination level than the system originally specified.

During the past year a new handbook was published on cold cathode fluorescent sources, and 8-foot T-12 cold-cathode fluorescent lamps operating at 240 milliamperes became more prominent.

Filament and Photo Lamps

In observance of Light's Diamond Jubilee, the world's largest electric lamp was produced earlier this year. This single lamp emits nearly 2½ million lumens and consumes 75,000 watts. The filament weighs 2.7 pounds and contains enough tungsten to make 67,500 60-watt lamps. Its efficiency is 32 lumens-per-watt, in contrast to the 1.4 lumens-per-watt produced by Edison's first practical lamp.

Infrared lamps of radical new design were developed in 500- and 1000-watt sizes. Using bulbs of ⅜-inch diameter tubular quartz, they produce the highest concentration of infrared energy yet developed by any source — over three times that possible with the popular 375-watt R-40 infrared lamp. Each of the new quartz lamps has 100 watts per inch of lighted length.

Figure 4. Several 75,000-watt incandescent lamps were made in 1954 for demonstration purposes in connection with Light's Diamond Jubilee celebrations. Also shown is a replica of Edison's first practical filament lamp.

Figure 5. Infrared lamps in T-3 quartz tubes make possible higher concentrations of radiant energy.

Other filament-lamp developments in the past year include an inside silica-coated lamp containing a built-in cut-out for subways, a smaller bulb (A-21 instead of A-23) for the 100-watt high voltage lamp, and 25- and 40-watt group replacement sign lamps. The latter two supplement the previously available 11-watt 3000-hour sign lamp.

An improved sealed-beam headlamp for cars has been developed which provides (1) greater seeing ability with the lower beam, and (2) better visibility in fog and adverse weather conditions. Fig. 6b shows how the amount of upward light has been reduced. The new lamp was announced October 28, and is being made available in those states where laws have been appropriately modified. It is anticipated that all legislation will be in order by the Spring of 1955. The automotive industry is

Figure 6. An improved sealed-beam headlamp gives better seeing in the lower beam and greater safety when driving in fog and adverse weather.

Figure 6a. The sharp reduction of stray upward light in the new sealed-beam lamp is apparent in this photograph showing the new beam pattern reflected against a screen.

Figure 6b. Stray light spreading upward from the present type of sealed-beam lamp can be seen clearly in this demonstration, in which the beam pattern is reflected on a screen.

also re-emphasizing the need for accurate aiming of headlamps to secure best seeing and maximum glare relief with the lower beam.

In the photographic lamp field, the trend toward smaller photoflash lamps continued during 1954. Last year's report described the No. 8 as a "sub-midget," thus posing a nomenclature problem to represent the *still smaller* size of the M-2 introduced last November. The M-2 uses a new B-6 bulb and a miniature bayonet base. The smaller size and lower cost of the M-2 make it particularly suitable for the inexpensive box-type and other fixed-focus cameras widely used by amateurs. Enough lamps to expose a full roll of film will easily fit into a suit pocket.

Figure 7. A new sub-sub-midget photoflash lamp was introduced since the last Progress Report. Twelve M-2 lamps can easily be held in one hand, enough to expose an entire roll of film.

Another new photographic item is a 500-watt R-40 flood lamp for film balanced to 3200K. This recognizes the increasing use of such color film for indoor pictures. For set lighting in television and movie studios, new 1000- and 2000-watt noise-free lamps have been developed to eliminate "singing" or "humming." This noise can be objectionable for both live and recorded productions when luminaires are close to microphones.

Mercury and Other Electric Discharge Lamps

Lamp development and application engineering activities on mercury lamps continue at an accelerated level. New types have been added and significant improvements incorporated in existing lamps.

Outstanding among the latter category is the greatly increased efficiency of the color-improved reflector mercury lamp, accomplished by omitting the vaporized-aluminum inner coating, and using the phosphor as the reflecting surface. The result is an increase in total light output of approximately 50 per cent, since the light developed by fluorescence can be emitted from both surfaces of the phosphor coating. Because most of the light is directed downward these new lamps give especially good performance in existing industrial reflectors

of the diffusing type and where dirt is an important factor.

Several other color-improved mercury lamps were announced this year. A 400-watt fluorescent mercury lamp in a BT-56 bulb is said to have color quality acceptable for office and store lighting. It produces 80 per cent as much light as the J-1 lamp. A 425-watt lamp, available with or without the phosphor coating, is designed for operation on 460-volt circuits with inexpensive choke-type ballasts. The 425-watt lamp is expected to reduce the mercury-lamp installation costs for industrial, flood and street lighting. The previously available 250-watt H-5 mercury lamp was listed in the color-improved type for installations where a medium-wattage source is desired.

In addition, two new small wattage mercury vapor lamps have been developed for street lighting and special applications in commercial and industrial service. The smaller, a 100-watt PS25 bulb lamp equipped with a mogul screw base, has a mean lumen output in the order of 2500 lumens. The larger size, designed for 175-watt operation in the PS30 bulb, has a mean lumen output of about 6000 lumens. These two sizes have a 5-inch light center length making them generally interchangeable with the popular 2500-lumen 6.6-ampere incandescent street lighting lamp. Both sizes are also available with fluorescent coating providing better color where needed.

Higher-wattage 48-inch photochemical lamps developed this year have permitted increased printing speeds. Increasing popularity of the "office type" printer has resulted in two new short lamps having outer jackets.

A 2500-watt short-arc mercury lamp helps fill out the previously discussed line of small but intense light sources for searchlight, projection and other specialized applications where brightness comparable to carbon-arc lamps is needed. Two similar 1000- and 2500-watt lamps using both mercury and xenon result in greater instant light output and quicker warm-up for searchlights than is possible with mercury alone. Experiments indicate that short-arc xenon lamps which have high brightness and an almost perfect daylight spectrum may find application in motion-picture projection.

The past year also resulted in an interesting sub-sub-midget glow lamp having source dimensions of 0.03 by 0.04 inches. It contends for the title of the World's Tiniest Lamp. Fifty of these lamps are used side by side for recording time traces on moving film in guided missile work. A companion glow lamp is available for similar applications where more light is needed.

Figure 8. The family of fluorescent mercury lamp sizes now consists of the 1000, 700, 425, 400, 250, 175, and 100 wattages. A 400-watt deluxe lamp in the large BT56 bulb with an outside ceramic finish is also available, providing a color of light suitable for commercial lighting.

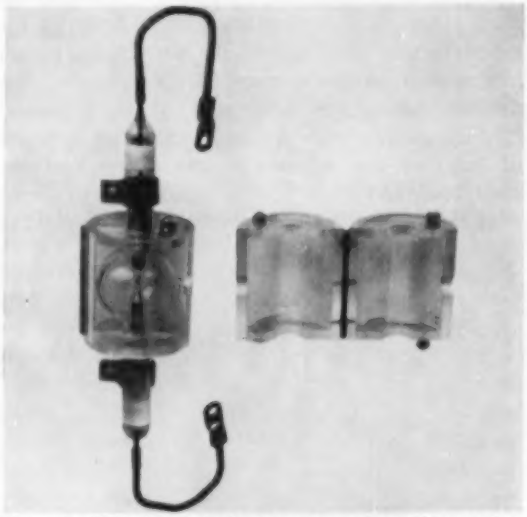


Figure 9. Experimental short-arc xenon lamps for projection service. Carrying case shown protects against breakage in handling.

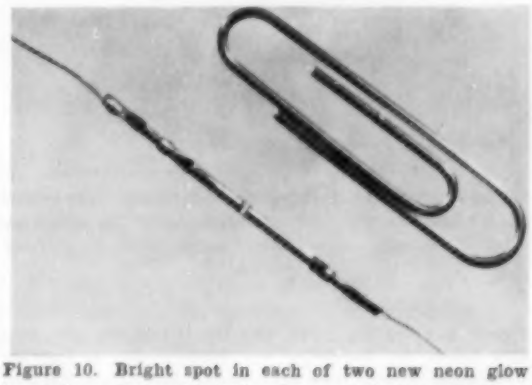


Figure 10. Bright spot in each of two new neon glow lamps is smaller and brighter for specialized applications. Twenty of type NE-101 lamps can be mounted side by side in space of one inch.

Progress in . . .

Lighting Measurement

Measurement is a fundamental basis of engineering, and lighting measurements are vital to lighting engineers. Important advances have been made in this field of science this year.

Luminous ceilings and other sources having large area present special problems in photometry. The fundamental inverse-square law, with its assumed point source, is not applicable to these sources. A photometric procedure termed "A Rectangular Coordinate Photometer for Large-Area Luminaires" was described in ILLUMINATING ENGINEERING during the year and represents a step forward in the field of photometry.

Accurate focussing is a prime requirement in the photometry of projection apparatus. A device for accomplishing this, and at the same time, giving information on the quality of the reflector, was devised during the past year at the National Bureau of Standards. An opaque mask is mounted in front of the reflector at the far end of the apparatus, and an extremely small lamp is placed near the focal point of the reflector on the axis of the apparatus. Examination of the shadow pattern on the screen at the left permits adjustment of the lamp for proper focus and reveals imperfections in reflector quality.

The rapid and accurate measurement of the luminous flux from small military type lamps and portable equipment for calibrating instruments for measuring brightness as well as the flux from these lamps were needed. To aid the manufacturers and the users of lamps and equipment of this kind, the National Bureau of Standards developed a portable, relatively simple and inexpensive flux meter and portable photometric calibrating unit.

One factor that has never been measured adequately before is the dirtiness of the space where luminaires are hung. Without knowledge of the dirt in the air it is not possible to evaluate luminaires and obtain realistic maintenance factors nor to establish cleaning schedules on an economical basis. Therefore, a device known as a "dirtometer" was developed by the IES Lighting Maintenance Committee. The outer case contains diffusing windows facing upward, downward, vertically, and 45-degrees upward. An inner drum contains a lamp and can be oriented to illuminate each window in turn. A measuring head, containing a lamp for reflectance measurements on each test surface as well as the photocell, completes the device. Thus, the reduction of both transmittance and reflectance caused by the dirt collected on the test surfaces can be determined.

Figure 11. (above) Portable meter measures light output of miniature lamps. Especially designed for checking vital instrument or indicator lamps used in military service.

Figure 12. (right) Tests with the Dirtometer, the new IES device for measuring dirt deterioration in lighting equipment, will be used to establish dependable lighting maintenance values instead of depending upon tables and estimates as at present.

Progress in . . .

Lighting Education

What we in the Illuminating Engineering Society can do ourselves to promote better lighting is limited. What we can do by teaching and inspiring others is limitless. Distinct progress has been made throughout the United States in the field of lighting education, with activity in many areas including new ones never touched before.

University Courses

Courses in illuminating engineering are offered in some universities and engineering schools and at least one university offers a four-year curriculum in the subject leading to a degree. Progress toward a more active development of this important aspect of the illuminating engineering profession would be stimulated by an increased demand on the part of high school students for engineering training in the lighting field. But before the high school student will be interested in any profession, he must be fully informed that it exists and what it offers in the way of opportunity. To supply this information is the responsibility of the profession itself. Possibly the I.E.S. should formulate a plan to start a program toward that end.

It is encouraging to note that over 85 per cent of those graduating from a full course in illuminating engineering have remained in the profession, which is a very high percentage of graduates remaining in a specialized field.

I.E.S. Advanced Lighting Courses

There has been continued worthwhile effort during the past year in lighting education sponsored by local sections and chapters of the Society. There seems to be great interest in this field. Attendance in lighting courses conducted by one important section was higher this past year than in all the previous years, having increased to 53 persons this year from 35 last year. Eighty-six diplomas were presented in two basic courses in illumination.

Commercially Sustained Associations

There is progress also in the field of "popular" education on lighting subjects. The Better Light-Better Sight Bureau introduced last Fall a new program for teaching light and sight in home economics classes in junior high school and high school, and in adult study groups. This program had a good reception and may be on its way to becoming as popular as the two previous teaching programs for elementary and junior high school science classes. A fourth program is to be released shortly for industrial arts classes.

The Chicago Lighting Institute has completed a successful year of all-day clinics and evening courses. An experimental course consisting of six talks on the fundamentals of lighting was presented to students at one of Chicago's high schools. This was in response to a request on the part of the school's dean and is a helpful development in creating interest in the illuminating profession at high school level.

The New York Residence Lighting Forum promoted a very successful eight-session course on principles and current methods of lighting residential interiors. Thirty-nine people registered for the entire course, with 112 registrations for individual sessions. The speakers in this series were outstanding in the field.

Joint University and Industry Education

The outstanding development this year was the home lighting workshop conducted at San Francisco in late June and early July. This was co-sponsored by the Better Light - Better Sight Bureau, the Northern California Electrical Bureau and San Francisco State College. This course, when offered last year by the San Francisco State College and the lighting Industry, was the first course on home lighting offered anywhere for upper division college credit. It was an outstanding success both years. The workshop is designed to interest a wide group — including homemaking and science teachers, lighting and color consultants, architects, builders, interior designers and utility people. It gives basic information on light and sight as well as an understanding of lighting needs for everyday activities.

Allied Arts Competition

One of the dramatic developments in illuminating engineering education is in the allied arts student competition. Tried out in Cleveland and known as the Cleveland Plan, the program consists of an organized competition for three-man teams of architect, engineer and design student. The subjects undertaken to date have represented a varied cross-section of architecture and design. It is believed that this important educational activity offers great possibilities for the I.E.S. at all locations.

Educational Publications

To assist the profession and the public, generally, in finding authoritative sources of information on lighting subjects, the Society through its Technical Committee on Residence Lighting, has compiled and published this year a "Resource List." This interesting feature lists the more recent and active sources of information on the subject of lighting including both technical and non-technical publications. Material is classified under five categories. It is intended that this resource list will be revised frequently so that it will continue to be a worthwhile aid to those seeking lighting information. It will be distributed to educators for home economics departments and similar uses.

Foreign Education

Of interest is the recent issue in Japan of the Lighting Data Book, written almost exclusively in Japanese. This follows the pattern of our I.E.S. Lighting Handbook and represents progress of our neighbors in the Orient.

What's New in . . .

Lighting Materials and Equipment

As with flame sources the electric lamp was at first used bare, without shades or reflecting surfaces of any kind. The increasing effectiveness of electric lighting today, however, is largely the result of better luminaire design providing comfortable, efficient and effective illumination in many cases with a high degree of beauty. With new materials and techniques the ceiling, the room or even the structure of the building itself becomes part of the lighting system.

The RLM Standards Institute at their meeting in June 1954 approved some radical changes in specifications which will not only improve the quality of the luminaires, but will enable the user to have high quality lighting in industrial areas. The present solid top reflector of RLM fluorescent industrial units will be eliminated from the specifications. The new specifications will call for equipment with upward lighting. One group will be listed with an upward component of 5 to 15 per cent, and another with an upward component of 20 to 30 per cent. Also, spring loaded type of sockets are to be used, channels are to be made for use with the sliding clamp type hangers, and reflectors are to be grounded.

A number of new types of materials for use in lighting equipment were announced during the past year. The most unusual of the group is a louver-like diffusion panel with a honeycomb type of construction. This is a new structural material available in various sizes. The manufacturer states that this new material can adapt itself naturally to luminous acoustical installation. It is made from thin aluminum strip to produce a hexagonal light opening about ¼ inch in diameter. This material, when used for ceilings, provides uniform lighting throughout the room; the manufacturer also claims a .46 noise reduction coefficient.

Figure 13. A nickel cadmium battery operates a new emergency lighting unit designed to provide an auxiliary 6-volt light which will come on instantly and automatically when the normal a-c supply fails. The Ni-Cd batteries have long been used in vital power services in Europe because of their characteristics of long life and freedom from need of care, both desirable in the emergency lighting field.

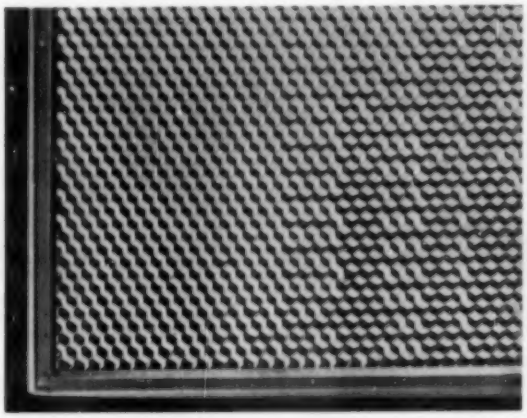


Figure 14. Honeycomb metal diffusion panel reduces glare and is effective in sound control. Photo above shows close-up of panel; photo at right shows installation.

Another material which has made itself useful for the luminous ceiling type of installation is the egg crate type louver made of plastic. This is made with small "egg crate" openings 3/8 inch square and 3/8 inch deep. These are available in panels 16 inches x 48 inches. This is another material which is being used in the ever growing market of luminous ceilings.

New lenses were developed during the past year. For example, a lens is now available in the same pattern both in plastic and in glass. This lens provides lengthwise control with overall brightness reduction. This is an important factor in modern continuous row type installations.

Ballasts are now made shorter to enable the equipment manufacturer to design more compact luminaires. Another revolutionary idea in ballast design was the ballast with a junction box added. This ballast was designed primarily for use in signs. The junction box simplifies the construction and the installation of the signs because the splices can be made in this box.

Progress has been made in the daylighting field, too. One manufacturer introduced a glass block with color added. This is the first time this has been done commercially. This line of blocks has been announced for classroom and office lighting, with features of lower panel brightness and less solar heat transmission. In the block there is a blue-green fibre glass screen which aids in creating a more comfortable daylighted environment.

A number of new improved lamp holders were developed, including a safety mogul type. It is

Figure 15. Small gauge grating of plastic has optical effect between that of a louverall and a luminous ceiling.

Figure 16. Safety mogul disconnect lampholder removes electric potential from lamp base and socket shell until lamp is almost fully inserted in socket.

Figure 17. Recessed down lighting provides adjustable spot size.

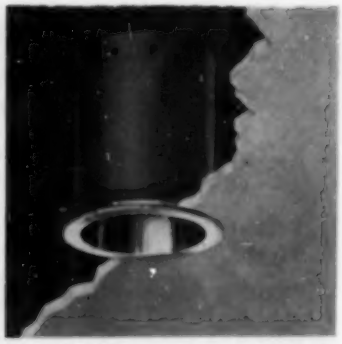


Figure 18. Recessed accent unit for reflector bulbs redirects wasted light and minimizes glare.

Figure 19. Inspection of interior of oil and gasoline drums, paint spraying or dipping areas is now made safe with explosion-proof hand lamp.

Figure 20. Prismatic reflector provides high efficiency of light utilization with explosion-proof and raintight luminaire for hazardous locations.

Figure 21. Water-tight submersible flood light used for search and study underneath the water. Particularly effective when submerged close to object at night.

Figure 22. Lighting unit is provided with ceiling element for light control and noise reduction.

Figure 23. End shadows are reduced in improved design fluorescent commercial unit with side panel strips extended around corners.

Figure 24. Tunnel luminaire for underpass and tunnel lighting with small end caps to reduce dark space between units.

designed in such a way that the holder shell, and hence the lamp base in it, is entirely electrically dead until the last fractional turn in the insertion of the lamp. The shell of the holder is always electrically dead as long as it is empty. This lamp holder was designed primarily for the new 425-, 700- and 1000-watt mercury lamps operated on 480-volt circuits.

For the four-foot bi-pin rapid start lamp, a new type of lamp holder was introduced giving the advantage of an individual mounted spring loaded type socket. Push-pull lamp holders were also designed for use with the new high output eight-foot rapid start lamp. Lamps, ballasts and lamp holders have the same dimensions as the 96-inch T-12 slimline, permitting the use of this new high output rapid start lamp in many of the present luminaire designs.

One trend seemed to be toward variations of the accent type unit. One device is a shallow recessed downlight designed for use in residential and commercial interiors. A unique feature is the adjustable alzak aluminum reflector, which permits the diameter of the circle of light to be controlled and changed as desired. For example, when installed 5 feet above the surface to be lighted, the circle of light may be varied in diameter from 4 to 6 feet.

Another accent unit for R40 reflector bulbs has a specular aluminum contour encompassing a series of pre-determined light-directing curves. These curves intercept the light normally wasted in the glare zone above 45 degrees and redirect it in a pre-determined pattern below 45 degrees to multiply the useful light output. The absence of brightness from any normal viewing position on the visible surface, plus the complete shielding of the lamp itself at 45 degrees, create a dramatic unawareness of the light source.

Among other interesting developments are the automatic ceilometer system with rotating projector. This new type of ceilometer, developed in cooperation with the United States Weather Bureau, automatically and continually measures the height of the cloud layer, day and light, in the approach lane to the instrument runway of an airport. This unit projects to the cloud a beam of modulated light which is reflected back to the receiver. It is able to detect the reflected modulated light in spite of the presence of daylight illumination in the clouds. The receiver transforms the beam of light into a signal that is transmitted to an indicator at the airport control tower, which may be at a considerable distance from the receiver. This newer type of equipment differs from the present units giving a cloud measurement each six seconds, instead of the present twelve seconds. Also, aluminized mirrors will be used to conserve the infra-red signal energy in the projectors and detectors, and longer focal length mirrors will be used in the detector to reduce the reflection losses at the photo-cell in infra-red filter.

A portable type of flood light was announced which was designed for operation under water. It is especially suitable for the operation of rescue squads and for forest and fire departments during emergencies, such as searching for objects or bodies. It is also suitable for use by divers working on equipment under water, around locks, dams, and reservoirs. This new type may be carried in the hand by a diver or lowered into the water over the side of a boat. A portable cable is used for lowering or raising this flood light.

A new explosion type luminaire with a prismatic glass reflector was announced. We believe that this is the first time an explosion type unit has been designed for appearance as well as for efficiency. This lighting unit is particularly recommended for use in laboratories, control rooms, pharmaceutical plants, and inspection areas. It is adapted for use wherever maximum utilization of light is desired. Maximum efficiency is obtained, and it compares favorably with ordinary non-explosion-proof units.

An explosion-proof hand lamp was announced. This explosion-proof trouble lamp provides a powerful concentrated beam of light to assist in maintenance work in location where hazardous gases and vapors are present. It is especially useful for inspecting interiors of oil and gas drums, process vessels and tanks, such as those used in paint spraying or dipping areas, and illuminating inaccessible gauges. The lens concentrates light into a strong beam.

A commercial type luminaire was introduced for lighting and sound control. Perforated wings on each side of the unit are backed with glass fibre padding. This element has excellent noise reduction and provides a high level of diffused over-all illumination — the first time that a package type unit was designed to incorporate both sound and light control.

Another commercial type lighting unit incorporates a new feature, luminous corners. It is conventional practice to utilize plastic side panels held in place by metal end caps. On this luminaire the black corners caused by the formed metal end cap are avoided because the plastic is run a short way around the corner, so that from a side view, the entire luminaire is luminous.

In the last year, several manufacturers have announced systems utilizing mercury lamps on

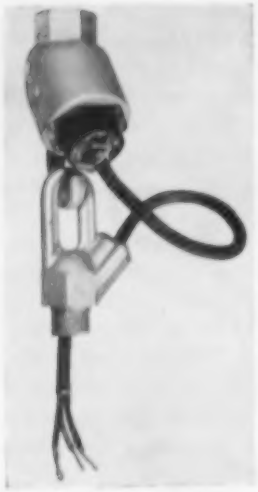
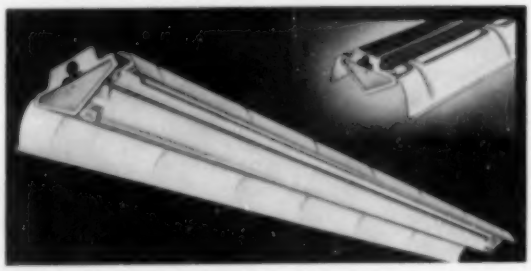


Figure 25. (left) Safety disconnect device provides ground wire and prevents unhooking of luminaire until circuit is opened. Particularly useful for 480-volt industrial lighting circuits.

Figure 26. (right) Corridor unit lights ceiling as well as walls.

Figure 27. (below right) New industrial unit providing high upward component of 20 to 30 per cent.



series circuits without individual ballasts. Such systems require that a film cutout be incorporated into the luminaire and that the luminaire be designed for high voltage cable connections and clearances for high voltage. In other luminaires, this film cutout is located within the lamp socket. Such an arrangement necessitates the removal of the lamp before access is had to the film cutout and makes servicing rather difficult. In a new design, the casting of the luminaire has been extended and a door has been provided in the rear of the casting so that the film cutout can be removed without opening the luminaire. In addition, the location of electrical parts, including the luminaire socket, has been so arranged that the luminaire will pass the ASA and NEMA standards for luminaires for use with 5000-volt circuits.

A tunnel luminaire designed primarily for underpass and tunnel lighting was introduced. It is extremely rugged and distributes its light over a wide area, so that the tunnel side walls and ceilings are well illuminated. This is the first luminaire of this type with smaller end caps to help to eliminate the dark space between luminaires.

A louver was designed to be used in connection with sportfield floodlighting. The use of the louver and floodlight combination permits lighting of sports and recreational areas with a minimum of spilled lght on the adjacent residential areas. This was necessitated on the Baltimore Stadium due to a ruling of a court in regard to the spill light on the adjacent property. The louver was functionally designed with an open area at the bottom and spill light upward is not objectionable.

A corridor lighting unit with a new look gives "three dimensional" lighting. The practice of spreading light over the corridor floor only has been superseded by three-dimensional control of light. It provides glare-free lighting so that the corridor areas will have the same high level, comfortable, safe illumination conditions now standard in major commercial and industrial interiors. Average brightness toward the viewer is less than one candle per square inch.

Another new item is a 480-volt safe change hanger. In the past, safe change hangers have been limited in voltage range to the 240-volt class. This new hanger is larger and more ruggedly designed and includes a receptacle and a plug rated by the underwriters for a 600-volt circuit. This hanger makes possible the easier maintenance of equipment supplied by the 480-volt "Y" systems in industrial plants.

A rugged type of industrial luminaire has a one-piece 8-foot porcelain reflector reinforced by ribs formed into the metal. Slots for upward light are strengthened by embossed apertures. These fixtures meet the new RLM specifications mentioned earlier. One design is for 10 per cent upward light and the other for 25 per cent upward light. The sockets are individually mounted and are completely metal protected. Louvers are provided for the 25 per cent upward component.

One of the most unusual types of equipment has been developed by the National Bureau of Stand-

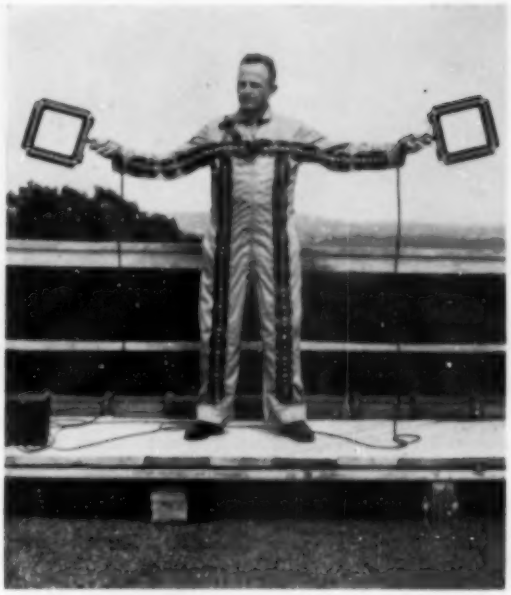


Figure 28. Day view of equipment for paddle man on a U. S. Navy airplane carrier.

Figure 28a. Night view of paddle man in action, signalling pilot to come in again.

ards in collaboration with the Navy to facilitate night landings of aircraft on carriers. It provides the Landing Signal Officer with a set of lights for his suit and paddle so designed that the signals presented to the pilot are easily interpreted and are as nearly like daytime signals as possible. The new equipment will replace the present arrangement which consists of fluorescent strips attached to the LSO's suit and to the paddles which are irradiated by ultraviolet projectors placed on the deck in front of the LSO. The development of this equipment was an outgrowth of several previous experimental efforts to improve night landing operations through the use of lighted wands, mechanical lighting devices, and miscellaneous lights attached to the suit and paddles. The equipment consists of a set of lighted strips and paddles, a control box, and interconnecting cables. The strips

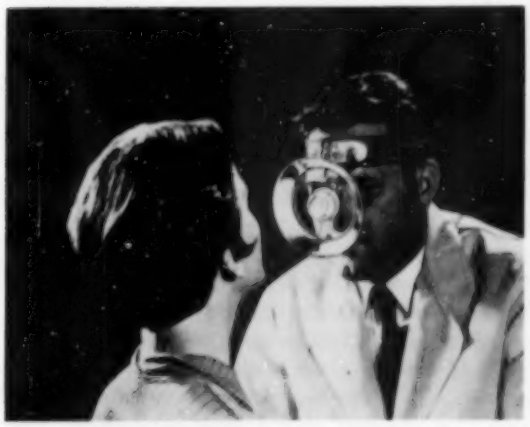


Figure 29. Headlight for doctors provides binocular view, evenly and intensely lighted. Lens and aluminum-coated reflector are of light weight plastic.

Figure 30. New mobile safety device, which is a 2- to 6-foot electric sign, mounted on the top of a truck cab, and spelling out the word "SLOW" in flashing electric lights has reduced accidents to street lighting maintenance crews. It is mounted on a small truck 30 feet behind the service truck used by electricians to service street lights from the top of ladders mounted on the truck base.

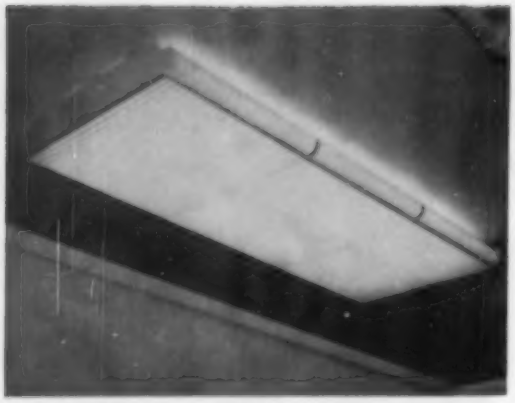


Figure 31. Large area luminaires now available provide effect of a sectionalized luminous ceiling.

Figure 32. A plastic dome provides daylight and housing encloses the ventilation system. New combination package unit is of special interest for modern flat roof homes.

Figure 33. The handle of this new mercury switch has a neon light which glows when switch is in OFF position. View here shows how switch looks in dark room.

Figure 34. Interesting garden lighting unit provides a pattern that blends with surroundings and provides good light for outdoor evening activities. Unit is simply stuck in ground where desired.

Figure 35. Plastic adaptation of colonial post lantern lends charm to driveway lighting in traditional home, is made of new thermoplastic material, is easy to assemble and can be painted as desired.

are designed to be snapped on the LSO's suit. The light is provided by small units employing a type 327 aircraft instrument lamp clamped onto rubber strips on the periphery of the paddles as well as on the suit. The control box has a master switch for turning the equipment "ON" and "OFF" and two selector switches for adjusting the intensity of the lights to suit the prevailing conditions.

Another outstanding development of the past year is the solar battery, which is the first successful device to convert useful amounts of sunlight directly into electricity. In its present experimental form, the Bell solar battery can achieve a 6 per cent efficiency in converting sunlight into electric energy. This approaches the efficiency of steam and gasoline engines, in contrast with other photo-electric devices which have never achieved more than one per cent. With improved techniques, the scientists and engineers who have been working on this project expect to increase this efficiency substantially — probably to 10 per cent. The battery is composed of strips of specially prepared silicon which converts sunlight directly into electrical energy. Experiments show that one square yard of surface under full sunlight will produce enough electricity to light a 50-watt lamp. The fact that the sun generates approximately 1000 trillion kilowatt hours of energy daily indicates the vast potential amount of energy waiting for us to utilize.

What's New in . . .

Lighting Application

Lighting Applications—U.S.A. and Canada

How far we have come in lighting application technique this year can be gaged from an examination of a few representative installations. These have been selected from hundreds available deserving mention. The choice was made so as to reveal the advances made in all fields of lighting as far as space would permit.

Home lighting was the first market envisioned by Edison and is now the biggest in terms of dollar value. Furthermore, it appears to have the largest growth potential.

A new development of particular value for the modern flat roof home is a ventilating and lighting plastic dome device. In one combination unit it provides daylighting and ventilation, and reduces building costs by permitting lower ceiling without requiring special roof curbing or flashing construction.

Glass blocks are being increasingly used in home building to provide privacy and daylight. They are also found of value in home decoration. In the bathroom glass block walls provide also a freedom from condensation of water damage.

Garden lighting in America was greeted with enthusiasm this year. New lighting equipment is available and popular demand has resulted in several publications of interest and general activity on the part of the home owner. Recently a large nationally circulated magazine dedicated three pages of colored illustrations on garden lighting and a 48-page booklet on the subject was published and released in large quantities to the field.

In the portable lamp field a new tag "Beauty Plus" identifies equipment with good design appearance and higher quality lighting performance.

A demonstration room with lighting design for living has been created at the Ford Museum, Greenfield Village. Thousands of men, women and children visit this model room weekly and are exposed to beautiful lighting in a living-dining area. This outstanding exhibit shows lighting for six critical eye tasks plus light for atmosphere and decoration. No one can but be impressed by the beauty, comfort and effectiveness of the lighting displayed in this room.

For household interiors, architecture and lighting and fabric design are coordinated for light control. The new development of fabrics woven with light reflecting material for color and distribution effects promises to start a new phase in room decoration.

In one home all four walls become the lighting system in a bedroom. Valances open at top and botton shielding a continuous row of fluorescent warm white lamps provide twenty footcandles for reading in bed and for make-up and writing, and ten footcandles for dressing and moving about. Correct lamp and face board placement in accord-

Figure 36. Special weave of draperies designed to reflect light as well as provide decorative element in the room.

Figure 37. Adequate and decorative illumination shown for dining includes a luminous wall and pierced metal ceiling units. Study lights and comfortable lighting for reading are shown in the background.

Figure 38. Demonstration home area light for beauty, comfort and utility in the living area with valance lighting and the new up-and-down adjustable ceiling light.

Figure 39. Garden lighting doubles the enjoyment hours. Localized lighting features beauty spots of special interest with unobtrusive new equipment designed for the purpose.

ance with IES recommended practice results in this successful solution for lighting the bedroom.

For gracious living today foliage and flowering plants share decorative importance in draperies and pictures, and new light sources and new lighting techniques keep plants green and healthy or make them grow and blossom anywhere in the house. Ordinary industrial types of fluorescent luminaires are used for growing. Enough light to develop and grow African violets, geraniums, begonias and other flowers is provided by such a unit operating from 12 to 16 hours a day. Tables are available providing the required levels for various types of leaf and blossom plants. Lower levels of only 20 to 60 footcandles provided by a 60-watt lamp in a small "planter" keep philodendron glossy green. It is necessary to hold back on the water to prevent rapid growth and to retain the desired shape and beauty in the plant.

Home rewiring remains a serious problem but a new financing plan is being tried out by some utilities.

Figure 40. Ordinary industrial fluorescent unit mounted over growing frame is adequate for wide variety of popular household plants.

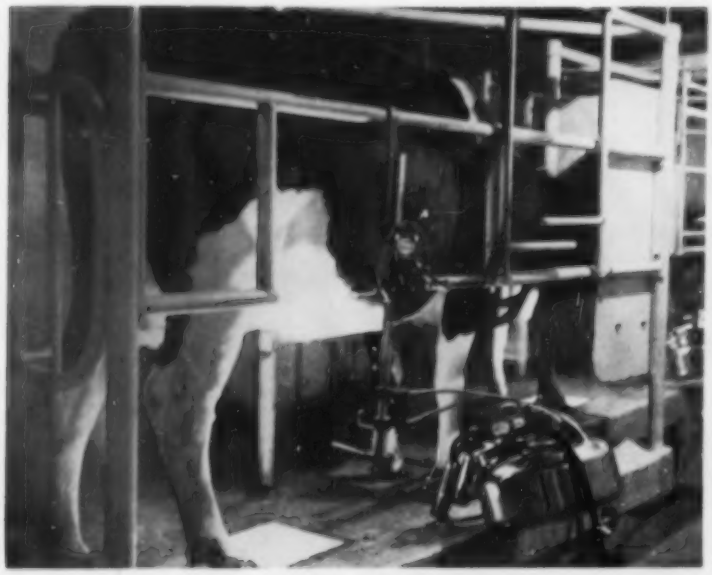


Figure 41. Floor-recessed milking light has hard glass reflector lamp used to prevent water cracks.

The "Diamond Jubilee" farm was a cooperative venture by a farm magazine, a group of electrical manufacturers and a utility. The farm home itself is beautiful, lighted without excessive expense by careful study on the part of the architect in conjunction with a home lighting specialist. All other phases of yard lighting and lighting for barn, workshop, etc., were perfected giving the farmer and his helpers quick, accurate, effortless seeing to improve his operations and increase farm profit.

Lighting is giving the American home a new look — more spacious and airy — more colorful and beautiful and for the man of the house especially it's more comfortable and easier to live in.

From the home where we find that we can now grow our own flowers in the cellar without the

Figure 42. The modern farm workshop with good tools includes good lighting.

Figure 43. A tremendous new horizon of applications for lighting is unfolding in the field of plant growth. These lights control the blossoming cycle of a field of chrysanthemums bringing them in to market on the exact day they are needed.

expense of a greenhouse we go to the professional grower and find that he too has found new uses for man made electric light.

In the school we find a startling and satisfying enthusiasm for lighting. School lighting programs today are a joy to contemplate for those of us who for years have striven in this field.

We look in on industry and note a gradual change in attitude toward lighting. The lathe worker is a vital link in production with thousands of dollars worth of equipment. Now he is being given high quality lighting commensurate with his importance instead of just light that's good enough to "get by."

With 55 million vehicles on the road and many more coming, we find a surge of interest in street and highway lighting such as we never encountered before. All types of light sources and luminaires are being utilized here and abroad in an effort to smooth the flow of traffic and cut the awful toll of life and suffering now being paid by the American motorist. That lighting can help greatly is fast being proved. Fluorescent lighting is making great strides today, chiefly with the new 6-foot lamp in large plastic luminaires. Mercury lighting, however, still gains momentum of major proportions — the trend being to horizontally burning 400-watt quartz type lamps in graceful prismatic units.

Figure 44. Progress in fluorescent street lighting during the past year includes its application in many new locations and the availability of several new types of equipment.

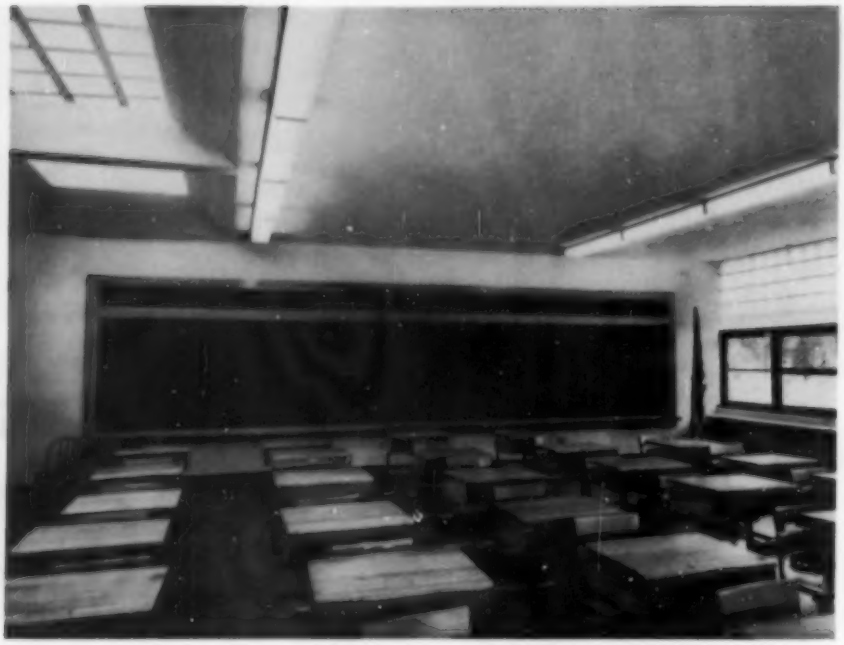


Figure 45. Three-way solution to low-ceiling classroom lighting — skylight, glass block wall, fluorescent strips.

Figure 46. The luminous ceiling is invading all fields of lighting. This usage in a church provides a skylight effect over the choir and serves to show the tremendous versatility of this form of lighting.

Figure 47. Luminous ceiling gets a new look with silver bowl incandescent lamps in alternate panels.

Figure 48. Circular fluorescent luminaire with radial baffles solves relighting problem in college reference library.

Figure 49. General lighting of 45 footcandles is supplied in college library with three 400-watt J-H1 fluorescent mercury lamps in converted luminaires.

Figure 50. Variable color distribution with adjustable level and distribution of illumination fulfills complete lighting requirements for fashion shows and other uses of this beautiful auditorium.

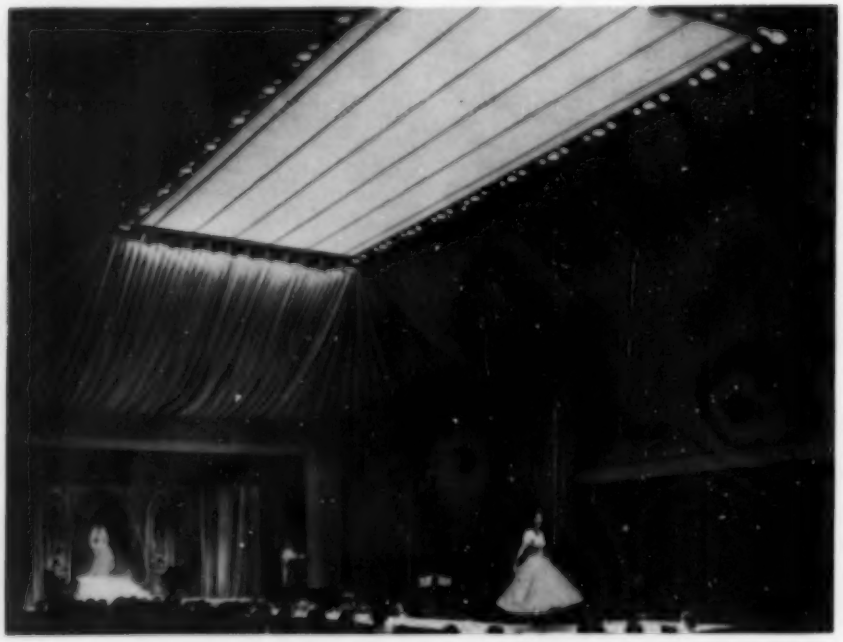


Figure 51. Channels for twenty-five 18-inch cool white fluorescent lamps are mounted between ribs inside this trailer truck. Lamps provide 20 to 25 footcandles and are held under spring tension to withstand vibration. Power is supplied through 40-foot extension cord on self-winding reel. Cord plugs into 110-120 volt line on dock.

Figure 52. Office lighting techniques are now being used in some industrial interiors.

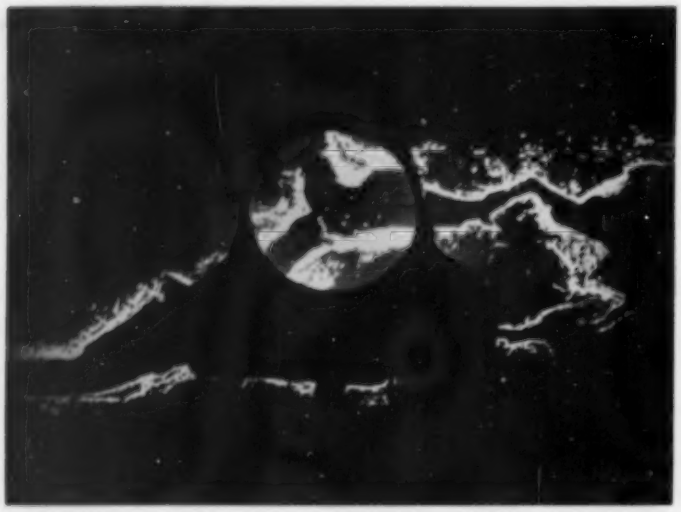


Figure 53. Chart with fluorescent pigment under black light looks similar to image on radar scope, and simplifies coordination of the two by the naviagtor.

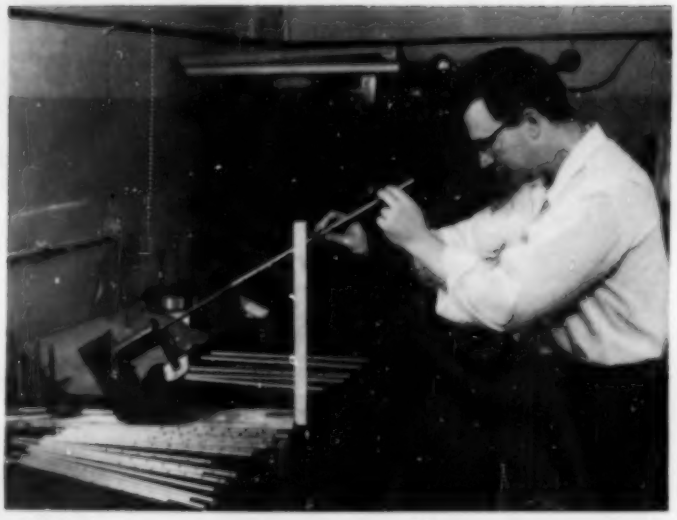


Figure 54. Inspecting the inside of a metal tube with unique optical system.

Figure 55. Ceiling baffles carry electric conductors, telephone cables, sprinkler system, inter-communication and other services.

Figure 56. Experimental fluorescent floodlighting luminaire has been employed here to provide a smooth spread of light across this bank parking area. Lamps used are 72T12 rapid start which maintain light output well at low temperatures. Lighting unit is neat and unobtrusive in appearance and blends in nicely with the building facade.

Figure 57. Streamlined and efficient fluorescent lighting of new subway station in Toronto, Ontario, provides safety and comfort. Tracks are also well lighted with wall-mounted fluorescent units.

This has been a great year in lighting — more lamps have been sold than ever before. More kilowatt hours for lighting have been consumed resulting in the production of more lumen hours of light than has been produced before in history. In the last twelve months we have used three times as many lumen hours as we did ten years ago. Clearly we are using light more fully and are enjoying it as we go.

Statistically we have made great progress in lighting. Furthermore, the beauty and effectiveness of our lighting has been outstanding not only in the United States but all over the free world. In this study of progress we find great accomplishments and there has been revealed plenty to inspire us for the future.

Some illustrations of Progress in Lighting Applications abroad are shown on the following pages.

Lighting Applications In Other Countries

We in America are often inclined to overlook the contributions of other nations. A survey of the rest of the world, however, shows that others have been light conscious in many areas for thousands of years and reveals that our foreign cousins have done great things with man-made light.

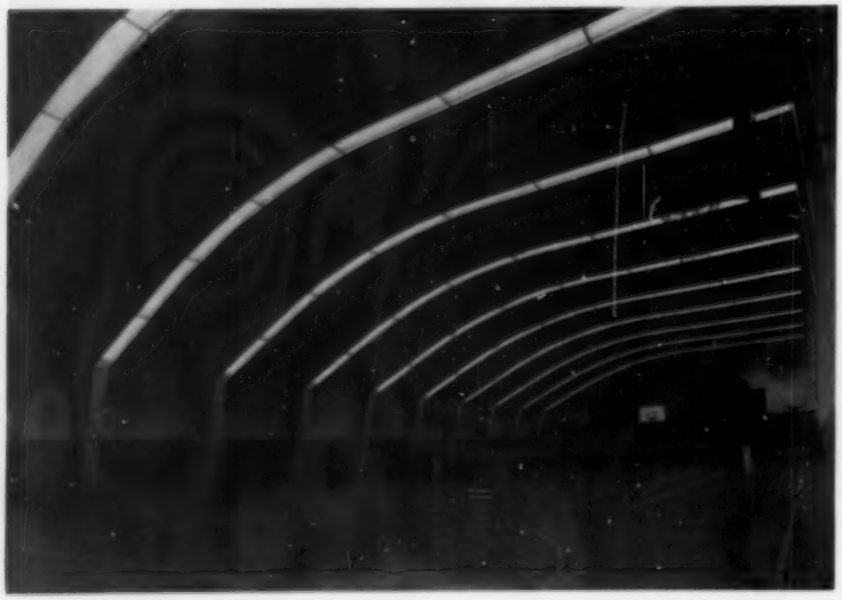
France

Incandescent reflector lamps of many varieties are growing in popularity in France. Specially shaped reflectors, some of them anodized aluminum in colors, are used to provide "projectors" which are being applied more and more to outdoor lighting. The yellow incandescent lamp, nicknamed "bug lamp" in America, is labelled PAR-INSECT in France and reports are given of studies made at l'Institut National de la Recherche Agronomique, during 1953, which indicated a 75 per cent reduction in insect attraction as compared to usual lamp types. The report states that the 582.5 millimicron line has the least attraction to insects.

The A.F.E. (l'Association Francaise des Eclairagistes) — French I.E.S. — held a very successful annual meeting June 7 through June 12, 1954 in Monaco. Papers were presented on outdoor, traffic and transportation lighting with special attention to lighting from a "touristic" point of view; tourists mean big business in Europe. The famous Rock of Monte Carlo was floodlighted with changing color effects controlled by a new device called "Chromoselecteur," which is trademarked internationally as CHROMON and described in U. S. Patent Application 344,117 (1953). With this device, intermixing and intensity controls can be made at will and with simple mechanical operation. At Monaco, in June a battery of 16 "projectors" under CHROMON control produced the spectacular color lighting of the Rock.

A new gymnasium lighting system at Sebastien Charlety Stadium in Paris University Club contains about 1380 feet of 200 milliampere hot cathode tubes mounted in grilled troffers. Lighting load is 1.28 watts per square foot and a 15-footcandle level is maintained. 50-cycle flicker is corrected by operating the rows in groups of 2, 3, and 2 luminaires, each group tapped to one phase of the three-phase supply. Each group of luminaires, either longitudinal or transverse in direction, is supplied by a separate phase so arranged as to give phase balance over all floor areas.

FRANCE — Figure 58. Gymnasium lighting at University Club of Paris. Continuous tube fluorescent units operated at 200 ma provide 15 footcandles. 50-cycle flicker is controlled by alternate phasing of units.



FRANCE — Figure 59. Lafayette Bridge over Rhone River at Lyon, France. 250-watt color-corrected mercury lamps were installed in existing incandescent fixtures at 22-foot mounting height.

One of the first applications of 250-watt color corrected mercury lamps was for bridge lighting. Existing incandescent lighting units on 22-foot standards were adapted to accommodate the new mercury lamps. 125-watt mercury sources have been reported previously for similar application. Decorative lanterns may contain four lamps, permitting flexible lighting levels according to traffic demand.

Italy

Italian architects are tending to design buildings to suit the requirements of the lighting. One example is a conference room in the "Institut Mendel" which has an acoustical pyramid-celled ceiling with 26-millimeter, 300-milliampere hot cathode deluxe cool tubing behind corrugated plastic strips. A beautiful modern Italian residence is entirely fluorescent lighted with daylight, deluxe cool and

ITALY — Figure 60. Conference room in Rome lighted with cool white deluxe lamps behind corrugated acrylic strips.

ITALY — Figure 61. Modern Roman villa entirely lighted by fluorescent sources with daylight, deluxe cool white and soft white colors.

soft white lamps. A shopping center in Milan, the Palace del Padio, uses 96T8 "Rose de France" (soft white) lamps (20 footcandles) for the upper floor restaurant and cool white deluxe lamps for the first floor portico lighting (30 footcandles); all units are harmonious with the architecture.

Holland

Railroad station platform canopy lighting at Rotterdam combines overhead roof contour with special cove luminaires giving essentially indirect illumination of 7.5 footcandles. Slotted surfaces permit some 10 per cent additional downward com-

ITALY — Figure 62. Fluorescent lighting for a shopping center near Milan. Rose de France (soft white) on the balcony, cool white deluxe for the first floor portico.

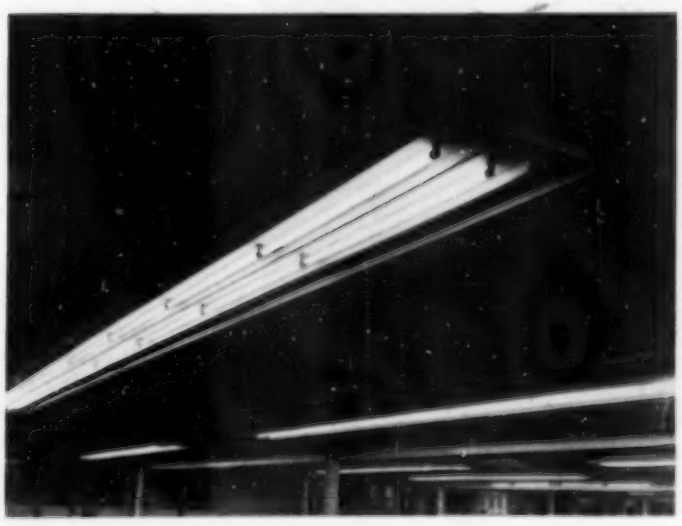
HOLLAND — Figure 63. The platform of Central Station in Rotterdam is lighted to 7.5 footcandles by 40-watt white fluorescent lamps in specially designed coves conforming to the architectural concept.

ponent at the platform edges. Fluorescent pole units light the platform areas not otherwise covered.

A combination radiant heating and lighting unit for outdoor service is reported from Holland in which steam pipes are mounted parallel with continuous rows of fluorescent strip units in an overall housing which may carry a double row of eight 40-watt lamps.

Great Britain

During the year there has been particular attention to transport lighting in England. The Midland Region of British Railways can now operate their car yards on a 24-hour schedule for storage and the marshalling of the principal expresses. The Willesden yard is an example. Gantries of pre-stressed reinforced concrete were built at 180-foot intervals over the sidings. 333 special design



HOLLAND —

Figure 64. Combination of steam heating and fluorescent lighting in one unit for outdoor shed lighting.

ENGLAND — Figure 65. Railroad yard lighting in Willesden, London Midland Region, by means of modified 200-watt street lighting lanterns mounted on concrete gantries.

200-watt filament enclosed luminaires are mounted 25 feet above the tracks and positioned to project in both directions between the tracks, thus eliminating shadows between lines of cars. Inside the car sheds special luminaires are used combining one 500-watt tungsten lamp, one 250-watt mercury lamp and two 5-foot 80-watt daylight fluorescent tubes. The fluorescent tubes give good upward lighting and illuminate the catwalks for access to cars.

Aberdeen Scotland, known as the "Granite City," has two main streets now lighted by vertical luminaires containing five 67½-watt cold cathode fluorescent tubes. Some of the units are mounted on the building facades and some are on sidewalk poles. Property owners are compelled by statute to keep building fronts clean, thus aiding good reflection.

ENGLAND — Figure 66. Close-up of anodized aluminum reflectors forming under surface of ceiling of British Research Building.

So far as is known, the first use in England of 8-foot 125-watt hot cathode fluorescent lamps at heights of 64 feet above floor level is in the transformer factory shown in Fig. 67. Each unit is individually serviced so that maintenance can be handled quickly by replacing the complete unit.

Combined tungsten and mercury vapor lighting continues to be one of the most common methods of lighting industrial interiors from high mounting positions.

A recently completed Design and Research building for an English engineering firm uses some 12 miles of cold cathode tubes in anodized ceiling reflectors which form the under surface of the office ceilings. The reflectors also assist in distributing heat since they are attached to the hot water pipes. They run at right angles to the normal direction of view from office desks and drawing boards so that the tubes are shielded from view.

In the Spring of 1954, two new fluorescent lamp colors were introduced in England. Deluxe warm white was announced with an average efficiency over the first 5000 hours of life of 30 lumens per watt. New warm white is said to have better efficiency than its predecessor and now is announced as an average efficiency of 54 lumens per watt over the first 5000 burning hours.

Another new departure is the use of a combined

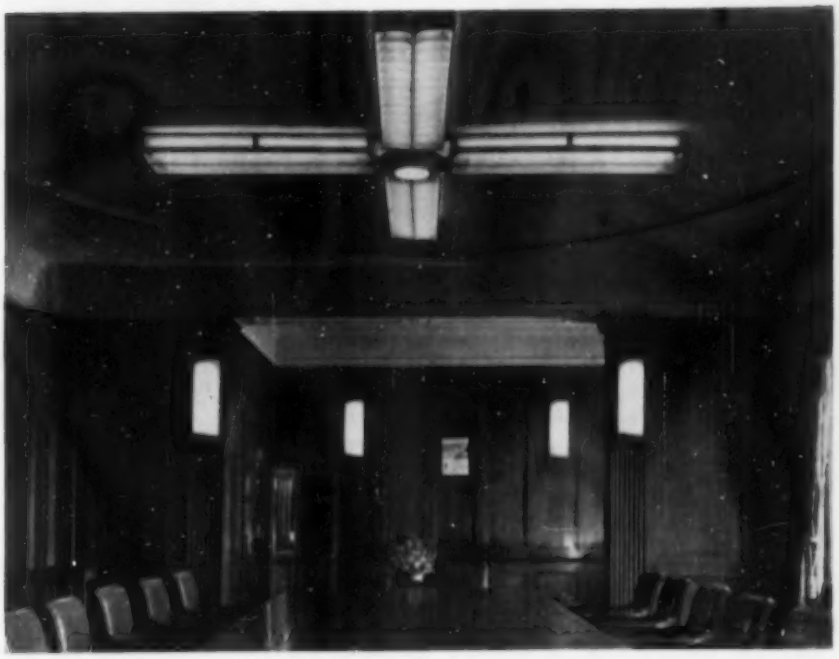
ENGLAND — Figure 67. Eight-foot 125-watt fluorescent lamps at 64-foot mounting height in a British transformer factory.

mercury discharge and tungsten filament lamp in a reflector type bulb. The bulb is approximately the same size as the present 150-watt reflector lamp. The filament is arranged around the mercury arc tube. The lamp consumes 200 watts and has a relatively heavy frosting on the bulb face. It is reported as very successful in use for plant irradiation.

BRAZIL — Figure 68. From Brazil comes an interesting circle design of louvers from a louverall ceiling. The variety of diameters of the cells used adds novelty to this departure from the conventional rectangular openings.

VENEZUELA — Figure 69. Underground highways on three levels are given an air of comfort and security with high-level fluorescent lighting in Caracas, Venezuela.

VENEZUELA — Figure 70. Y-mounting of fluorescent luminaires matches girder construction of underground bus station, Caracas tunnel system.



JAPAN — Figure 71. Four 2-lamp 40-watt luminaires mounted in the form of a cross illuminate this office in Tokyo. Luminous elements on the wall near the ceiling are used to add interest to the lighting.

Japan

Since the war the Japanese have turned their tremendous energies to peaceful pursuits including developments in lighting. A fluorescent office lighting system in Tokyo shows their quick adaptation of this new type of light source with 48-inch 40-watt fluorescent lamps mounted in the form of a cross. Their lighting data sheet shows the results obtained with this system in this particular room.

Fluorescent lighting is being introduced into the Japanese homes where it blends well with the architecture of the beautiful airy dwellings.

JAPAN — Figure 72. Fluorescent homelighting in Japan blends well with airy spacious interiors.

Discomfort Glare and Glare Factor Calculations

By PHELPS MEAKER

A step-by-step sketch for calculating discomfort glare by the Glare Factor Method. Labor-saving routines are emphasized, and the assumptions and compromises necessary to formulate a practical routine.

DEVELOPMENT of a routine procedure for calculating glare factors is a good example of the stages that must intervene between the concept of a basic idea and its reduction to practice. In 1947 as many as four days were spent in calculating data for a table of glare factors. Now, with a standardized routine, an experienced person can perform this work in a little less than four hours of uninterrupted computing time. Of this, less than twenty minutes are devoted to actual slide rule solutions of the glare factor equation. The remainder is in selecting photometric data, recording dimensions, and adding up the glare factors computed for various elements, thus deriving the tabular data from the computations.

In this article it is proposed to sketch briefly the steps in computation, emphasizing the labor saving steps, and the assumptions and compromises necessary to formulate a practical routine. It has been the aim to make this routine quite inflexible, such that anyone might apply it without knowledge of the fundamentals of visual comfort.

The evaluation of discomfort glare by the Glare Factor Method is based upon an empirical formula which was derived from experience and research. It gives different weights to the effect of source size, brightness, position, and surrounding brightness in the lighting installation. As originally applied,[1] the formula is:

$$\text{Glare Factor} = \frac{\text{Source Area} \times (\text{Brightness}/1000)^2}{(\text{Height above eye level})^2} \times \frac{\text{Location Coefficient}}{\text{Surround Factor}}$$

However, since detailed data on a fluorescent luminaire are usually confined to candlepower distribution curves, the equivalent formula in terms of candlepower is more convenient:

$$\text{Glare Factor} = \frac{(\text{Candlepower toward the eye})^2}{4.9 \times \text{Height}^2 \times \text{Projected Area}} \times \frac{\text{Location Coefficient}}{\text{Surround Factor}} \quad (1)$$

The figure 4.9 in the denominator comes from $(1000/452)^2$ in the transformation from thousands of footlamberts to candlepower. For simplicity we will substitute 5.

Location Coefficient/Height^2 expresses the relative glare factor of a source located in any position in the plan layout of the room. It introduces the effect of position relative to an assumed reference direction of gaze, and also the effect of distance upon visual size. Location coefficients published in Reference No. 1 and as Fig. 2-28 in the I.E.S. Handbook (second edition) have since been modified following the researches of S. K. Guth.[2]

Height of the light source above eye level is measured in feet. Ordinarily eye level is taken as four feet from the floor.

Projected Area of the luminaire is in square inches and usually is an actual area times a factor depending upon location and orientation relative to the observer.

Surround Factor evaluates the effect of brightness of the environment upon sensations of discomfort. The underlying thought is that difference between source brightness and the brightness of the area upon which the gaze is resting is an important factor in discomfort. For the sake of uniformity in all calculations, wall brightness at approximate eye level is the value used to look up the surround factor in a chart or table.

Formula (1) has to be solved for each luminaire that adds to the sensation of discomfort or annoyance. For each one, there will be a different set of angles for reading the candlepower, a separate location coefficient; and different geometry will apply in figuring the projected area. To avoid much laborious work, the procedure has been

AUTHOR: General Electric Co., Lamp Division, Application Engineering Dept., Nela Park, Cleveland, Ohio.

greatly streamlined by making one standard layout, for which vertical and horizontal angles, location coefficients, and area factors can be determined once and for all, and printed on the work sheets. This method has the real advantage of fairness and uniformity, for all luminaire designs are evaluated according to exactly the same routine. The glare factor value resulting from the adding of all the individual calculations may be called a sampling of glare factors from all over the room.

The routine of calculation that will be described will apply for an installation to provide 50 footcandles maintained, and covers suspended fixtures of types other than indirect and semi-indirect. The example will deal with a luminaire whose downward output emerges through a flat bottom opening.

The fixed layout is for one fixture in the center of each 5-foot by 5-foot square. The layout is illustrated in Fig. 1, where the observer is at the center of one wall, looking toward the opposite wall. Calculations will be made for sources to one side of the line of sight, and then multiplied by 2. Rows of fixtures 2½, 7½, 12½, and 17½ feet to the side are to be considered; when doubled, the sum of them all represents a room 40 feet wide. At distances more than 30 feet ahead of the observer, where angles change slowly, the areas treated as a unit are increased from 25 sq. ft. to 50, 100, and 167 sq. ft. The work sheet constants are weighted accordingly.

A layout based on one fixture for each 25 square feet will probably never provide an illumination of exactly 50 footcandles maintained. Therefore we must add a correction to formula (1) to adjust the number of luminaires per five-foot square. In effect, we will solve formula (1) for a complete luminaire and then correct this answer to the number of units, or fraction of units actually needed. The addition to the formula, assuming 70 per cent maintenance, is as follows:

$$\frac{25 \times 50}{.70 \times \text{Lp. lumens per luminaire}} \times \frac{1}{\text{Coeff. of Utilization}} \quad (2)$$

Since glare factor is directly proportional to fixture area or number of fixtures, the expression (2) becomes a multiplier in the glare factor formula, which may now be written:

$$\frac{Cp^2 \times \text{Loc. Coeff.} \times 2}{5 \times H^2 \times \text{Proj. area} \times \text{Surround Factor}} \times \quad (3)$$

$$\frac{25 \times 50}{.70 \times \text{Lp. Lumens}} \times \frac{1}{\text{Coeff. of Util.}}$$

Note that the multiplier 2 in the numerator accounts for the units in the left hand side of Fig. 1. Since coefficient of utilization depends upon the actual room proportions, this item will not be included until the last stage of the summarizing. For the present, computations will assume 100 per cent utilization.

It is now time to discuss how each of the quantities in formula (3) is obtained.

The first step will be to replot the candlepower distribution data for the luminaire in such a way that values at the horizontal and vertical angles indicated on the work sheet can readily be taken off. Rather than cross-plot the data, it is perfectly feasible to read these candlepowers directly when the luminaire is mounted on the photometer. Space is allowed on the work sheet to enter the squares of the candlepower values.

The projected area of the luminous louvered bottom opening of the fixture is equal to its actual area (assume 48" x 13"), multiplied by a reduction factor (r.b.). For a case where height is six feet, and lamp lumens are 4600, formula (3) at this stage may be written:

$$\frac{Cp^2 \times \text{Location Coefficient} \times 2}{5 \times 36 \times (48 \times 13 \times \text{r.b.}) \times \text{Surround Factor}} \times$$

$$\frac{25 \times 50}{.70 \times 4600} \times \frac{1}{\text{Coeff. of Utilization}}, \text{ or}$$

$$\frac{Cp^2 \times \text{Loc. Coeff./r.b.}}{56{,}100 \times \text{Surround Factor}} \times \frac{.388}{\text{Coeff. of Utilization}} \quad (4)$$

The quantity Loc. Coeff./r.b., being constant for each of the locations spotted on Fig. 1, is tabulated on the work sheets.

The surround factor is made up from two quantities, wall brightness and the "silhouetting" immediate background brightness adjacent to the luminous area of the fixture. If no detailed data are available, the wall illumination is assumed to be one-half of the actual work-plane illumination. An empirical formula is used to obtain a typical ceiling brightness between fixture rows to serve as the immediate background. This is not, however, the average ceiling brightness. Having values for wall and ceiling brightness, the surround factor can be taken from a table in Reference No. 1, or Table 2-3 in the second edition of the I.E.S. Handbook.

If the value of surround factor is 1.74, we may fill in and condense formula (4); reducing it to a

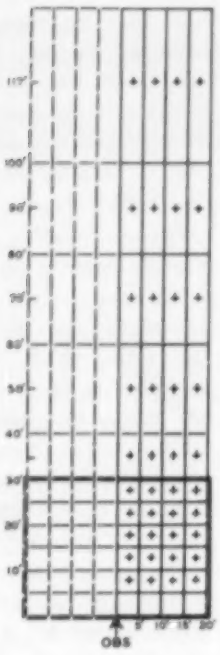


Figure 1. Standard Layout. Crosses at centers of squares and rectangles indicate the luminaire locations for which computations are to be made.

form that can readily be solved by slide rule:

$$\frac{Cp^2 \times L.C./r.b. \times .388}{56{,}100 \times 1.74} \times \frac{1}{C \text{ of } U}$$

$$\frac{Cp^2 \times L.C./r.b.}{252{,}000} \times \frac{1}{C \text{ of } U} \qquad (5)$$

Solutions of formula (5) will give the glare factor for the fraction of a luminaire required in each rectangle of Fig. 1 to give 50 footcandles, assuming a maintenance factor of 70 per cent and a coefficient of utilization of 100 per cent.

Ordinarily there are forty solutions of formula (5) for endwise arrangement of luminaires, and forty for the crosswise arrangement. The work sheets are laid out to keep these operations in orderly arrangement.

It is now necessary to total the individual glare factors computed by formula (5), giving the values for all of the rectangular rooms included in Fig. 1. As an example, data for a room 30 feet long and 40 feet wide with sources six feet above eye level would result from adding all the solutions corresponding to positions indicated within the double-line rectangle in Fig. 1.

If 12 luminaires are required to light a room 20 x 20 feet, with the units six feet above eye level; and 48 to light a room 40 x 40 feet with similar units twelve feet above eye level, the glare factors of the two rooms would be the same. Differences in utilization have been overlooked in this comparison. The point is that if height is taken as the distance above eye level, and the space between eye level and the luminaires has similar proportions, the two rooms lighted to equal levels will have the same glare factor. Expressing room dimensions in terms of height above eye level; room width becomes RW/H and room length, RL/H. All of the totalized work sheet data can be plotted in these terms, representing rooms of all dimensions included in Fig. 1. In Fig. 2 is shown a plot of relative glare factors for a typical problem. A summary sheet is arranged with instructions for taking off data for other mounting heights and room dimensions. This sheet also has the corresponding room ratios tabulated, according to which the applicable coefficients of utilization may be entered in spaces provided. As a final step, the values read from Fig. 2 are divided by the decimal coefficient of utilization to supply the final glare factor, for entry in a glare factor table.

For luminaires with luminous sides, or curved louvered bottom openings, the procedure is somewhat different as regards the projected area. The equation corresponding to (5) will have ten differ-

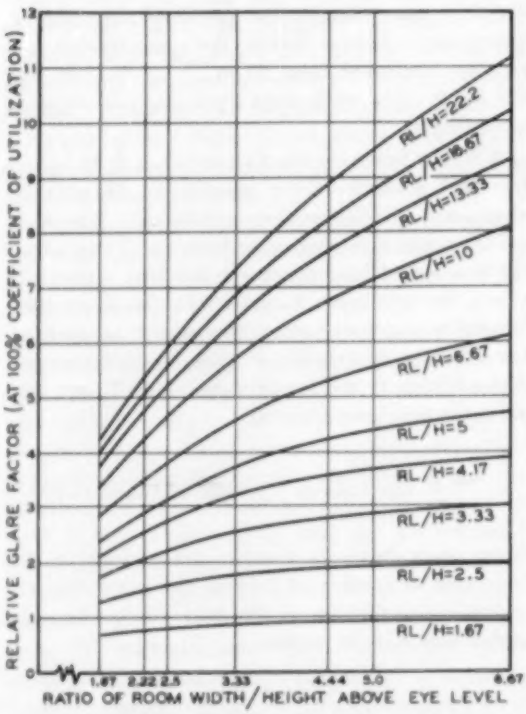


Figure 2. Plot of totalized work sheet data in terms of room dimensions. Represents a crosswise arrangement of luminaires with luminous sides.

(Taken from an example in the complete instructions.)

ent values for its denominator, to be used as instructed.

The author has a limited number of copies of a detailed procedure, with complete sample work sheets, available to those readers who are interested in actually experimenting with glare factor computation.

As experience has built up in the computing of glare factors, several extra steps are at times desirable. For example, if the ceiling brightness is such as to contribute more than 30 per cent of the illumination, glare from the ceiling should also be included.

References

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An Analysis of Twelve Solutions to a Home Lighting Problem

Discussion of paper by Laurence Schmeckebier, George Danforth, Karl Staley

(Published October 1954 issue of ILLUMINATING ENGINEERING)

ONNIE MANKKI:* The Allegheny Chapter of the Society of Industrial Designers has been keenly interested in sponsoring this activity [AIA-IES-SID Student Competition]. Members of the Society have already been active in the design of products which may be considered as "architectural components" *i.e.* products that are specified by the architect in the construction of buildings. Looking into the future, certain trends are already quite evident. As factory labor increases in efficiency at a greater rate than field labor and automotion enters the picture, it is only natural that the trend toward prefabrication of architectural components will continue. Lighting elements are no longer items selected at the completion of a project but are integral elements of architecture designed into the building during inception. The increased necessity for close collaboration between architects, responsible for assembly of components into architecture; illuminating engineers, responsible for effective application of the scientific principles of illumination, and industrial designers, responsible for design of components architecturally appropriate and suitable for mass production, becomes apparent.

New factors are entering the equation. Economy of means calls for integrated organic solutions rather than those based on superficial decoration of functional elements. It calls for an integration of effort rather than doing things in sequence. The structure becomes the form and *vice versa*. The products roll through automatic manufacture, assembly, and distribution to a broad market. It must fit some modular pattern that makes interchangeable assembly in the field possible. All of this is possible only when the functional specialists, i.e. architects, illuminating engineers and industrial designers, thoroughly understand each other's problems and approach.

We, as a group, definitely feel that this student competition in Cleveland has contributed much to the solution of these problems that will face us. By bringing about collaboration at the student level, it has acquainted students in these professions with each other in a close working relationship. It has already brought the professional sponsors together. The exact pattern of the future may yet have to be developed in response to specific circumstances but as a group we look forward to the future with considerable optimism.

ERNST PAYER:* For several years I have had the pleasure to follow closely the so-called nine-letter competition, sponsored by the three professional societies, whose initials give this annual event its name.

As a practicing architect I have often wondered about the strange lack of contact between closely allied professions. Collaborations at student level, such as this annual competition in Cleveland, approach this problem in an exemplary way and at the roots. It is almost unbelievable that similar collaborations have not spontaneously organized themselves, wherever institutions of allied fields find themselves geographically near each other.

During the last several generations the volume of knowledge in all sciences has grown so enormously that specialization by necessity becomes increasingly precise. The professional in every field finds that he must constantly consult more and more specialists to solve his problems.

It is especially the architect who should, during the process of planning, know when to call in each one of his many consultants. In the growing complexity of all our structures almost all parts are interdependent and only well-organized teamwork can produce a really integrated result. It should be a matter of course, though often forgotten, that monumental sculpture or interior decoration, just for example heating or structural engineering or lighting, should be considered from the very start.

There is no indication that, as humans, we are constantly growing more intelligent, but each generation finds a larger amount of knowledge accumulated for its use. As knowledge is not directly inherited but must be acquired by each one individually by study, it is apparent that a proportionately earlier start of serious study, more time for general background before definite specialization, is required. Advances in the ease and security of living make an average education attainable by more, and consequently, a greater selectivity of admission to higher graduate work can and should take place.

Professional societies have the pleasant obligation to collaborate with our institutions of learning. We can allow

*Cleveland, Ohio.

*Architect, Cleveland, Ohio.

them to profit from our own experience, and our mistakes and insight in our shortcomings and help them to help others to go beyond us and rise to a height of professional perfection which we ourselves could not attain.

The annual collaborative competitions in Cleveland are a first, an excellent and all too isolated example of one approach to this problem.

LAURENCE E. JOHNSON:* If these is to be the coordination of effort between the two branches of the arts, we must find a common language to convey our ideas. The cooperative design project Mr. Staley has described, coming as it does during the early training period of the student's work, can result only in better work all the way around.

This is encouraging progress in the development of useful, comfortable and interesting interiors.

L. C. KALFF:** The idea of competitions for residential lighting problems has been taken up in different countries in Europe in the Thirties, when the U.S.A. also had the first annual awards. Since then it has died down and I know of no such activity in Europe. It would probably be of interest to start it again on an international basis, now that architecture and industrial design have become much more international there.

May I mention a few remarks.

It is difficult to judge if really three phases have to be obtained. The Architecture may have its merit and the Lighting may be poor, or even the Design of the lighting fixtures may be good and the lighting effect still poor.

The designer and the architect both should try to find a solution to definite lighting problems and develop new lighting means for that purpose.

In general we all too often see that the designer of new fittings is only concerned about the appearance and presentation. The fantastic lamp standards in driftwood, abstracts, immobiles and such do nothing in improving the effect of a 100-watt lamp with a cylindrical or conic lampshade on top of it.

I believe it would be interesting to incorporate into the theme of the competition some fundamentally new lighting problem, as lighting a wall and a picture at the same time as the reading task of a person sitting in the room or of arranging a combination of effects, so that a dining-room can be used with different effects and for different occasions.

E. W. COMMERY:† Mr. Stephenson's paper "The Interior Designer Looks at Lighting" (Published October 1954, ILLUMINATING ENGINEERING) and the paper presented by Mr. Staley bring new, refreshing and valuable material to the Society. In all fairness to the Society I believe these papers are of such content and stature that they could well have been on one of the general sessions.

The illuminating engineer of necessity must be on the best of terms with light sources, equipments and instrumentation — all that is objective — since they are the tools of the practitioner. The application of these to interiors and exteriors also comprise ever-growing techniques. More recently the lighting designer is being called upon to work to serve many of the subjective requirements of man. Failure in this discounts all the know-how that the lighting designer may otherwise acquire. Understanding the subjective requirements aside from the obvious one of minimizing glare opens avenues of communication between the lighting designer, the interior designer and the architect which the Society has long sought to build.

Each of the authors opens some of these doorways of communications. Mr. Stephenson's simple forthright three-point program for orienting the design of interiors is one that many of our lighting practice committees should find of extreme value in their studies and pronouncement.

The project reported by Mr. Staley and his associates, Messrs. Schmeckebier and Danforth shows the gratifying accomplishment that may be effected by essentially every Section and Chapter of the Society. A close reading of this paper sets forth the fine understanding that can be developed between student architect-designer-engineer teams when they are guided by an intelligently planned program; in this case a project which included the Cleveland Sections of the Illuminating Engineering Society, the American Institute of Architects and the Society of Industrial Designers in collaboration with Western Reserve University, Case Institute of Technology and the Cleveland Institute of Art.

The excellence of the solutions developed by these student teams compares favorably with the work done by men of mature experience. Scarcely ever has so much been accomplished over such a short period of time.

In this instance the "faculty" presenting the lighting lectures and criticisms were basically aware of the Society's Recommended Practice of Residence Lighting which no doubt is reflected in the work of the student teams even though the printed edition of this practice was not supplied to the students.

A plan of suggested operation for similar programs has been developed by Mr. Staley and members of a new subcommittee of the Residence Lighting Committee of your Society. This plan is sufficiently developed for inclusion in the working program of any of our sections and chapters today. Our hope is that this paper foreshadows an annual report of the Society's efforts across the country.

KARL STALEY:* The comments of Messrs. Mankki, Payer, Commery, Kalff and Johnson are gratefully acknowledged. It is hoped that the authors' dream of extending the plan nationally through other local contests may come true. The thought that it might reach international interest gives us further encouragement. Some written suggestions for organizing the collaborative have been prepared and it is hoped will be released soon by Council.

For the most part, however, a collaborative plan could be worked out with little or no outside help by a sizable number of cities in the United States — certainly in all Sections. The architectural and design schools have had years of experience in this sort of endeavor. Our specific contribution is mainly in tying the architect, the engineer and the designer together with a common bond.

The other half of this task may well be in our learning the language of the other crafts. One astute member of the Cleveland Section remarked recently, "Too many of our meetings consist of us talking to each other about our own stuff." A collaborative like this one confirms a like statement by Dr. Payer at one of our committee meetings to the effect that "a professional man can always benefit from extending his knowledge of allied fields." Certainly if he can benefit by the cooperation, so much more lasting and useful can such contacts be to the students.

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†General Electric Co., Nela Park, Cleveland, Ohio.

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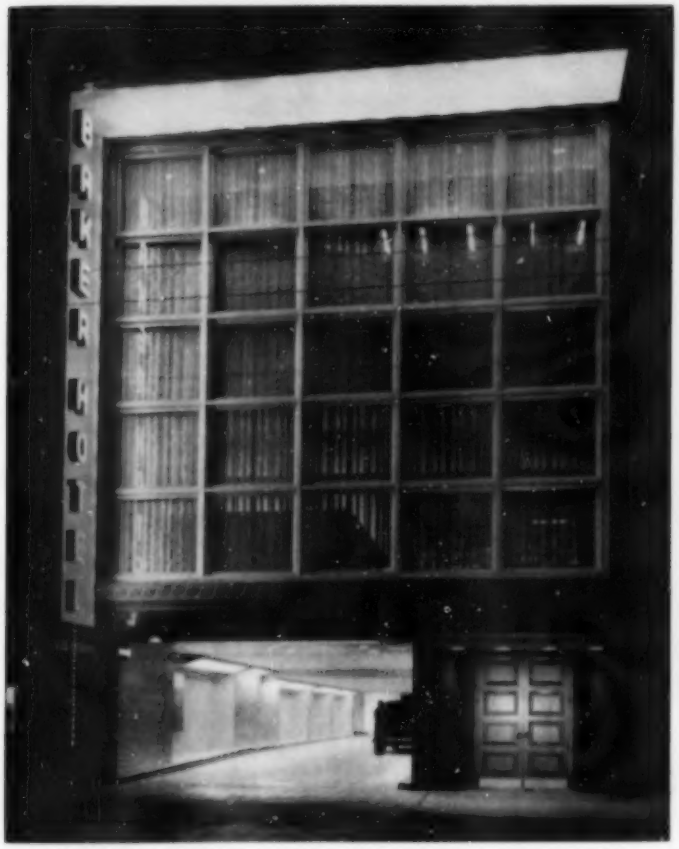

INSTALLATION AT BAKER HOTEL, DALLAS, TEXAS.

Lighting a Hotel Automobile Entrance

LIGHTING OBJECTIVE: To identify a city hotel and illuminate the driveway and walkways within the automobile entrance.

GENERAL INFORMATION: The dimensions of the window facade framed by the lighted sign and canopy are shown in Fig. 2. Figs. 3 and 4 show the interior area where patrons leave their cars. Colors and reflectances of the interior are as follows:

ceiling	gray	70% RF
upper walls	white	80% RF
lower walls	cream	70% RF
floor	concrete	55% RF

INSTALLATION: The sign letters are 24 inches high, formed with double red sign tubing in a 4-inch channel. Other details of the sign and canopy are shown in Fig. 2.

Fig. 3 indicates the location of all interior lighting equipment. The maximum interior illumination is 70 footcandles, minimum 10, and average 30.

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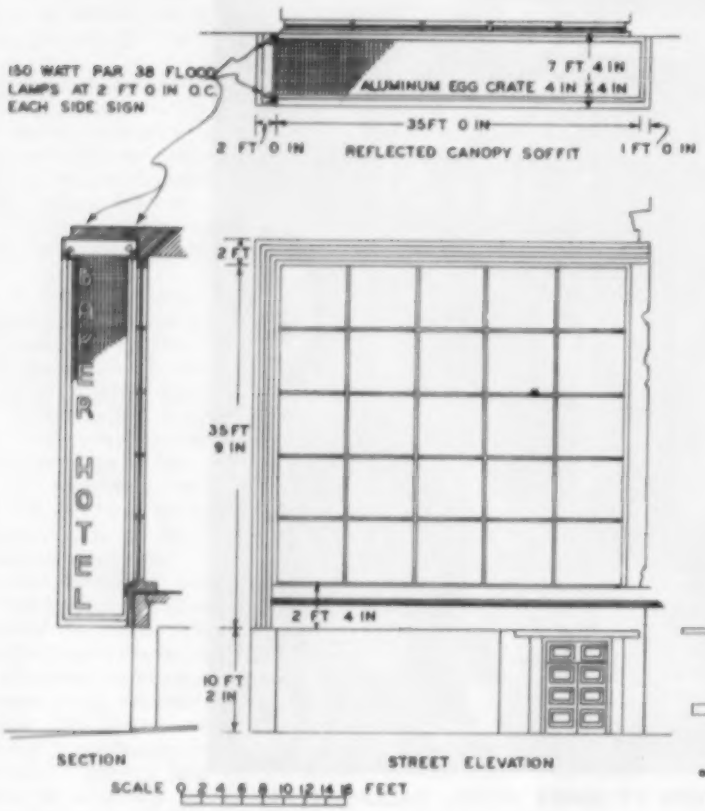
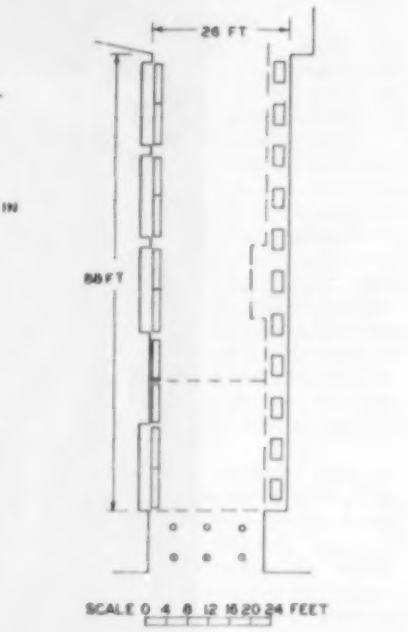

150 WATT PAR 38 FLOOD LAMPS AT 2 FT 0 IN O.C. EACH SIDE SIGN
7 FT 4 IN
ALUMINUM EGG CRATE 4 IN X 4 IN
35FT 0 IN
2 FT 0 IN
REFLECTED CANOPY SOFFIT
1 FT 0 IN
BAKER HOTEL
2 FT
35 FT 9 IN
2 FT 4 IN
10 FT 2 IN
SECTION
STREET ELEVATION
SCALE 0 2 4 6 8 10 12 14 16 FEET

Figure 2. Details of facade lighting.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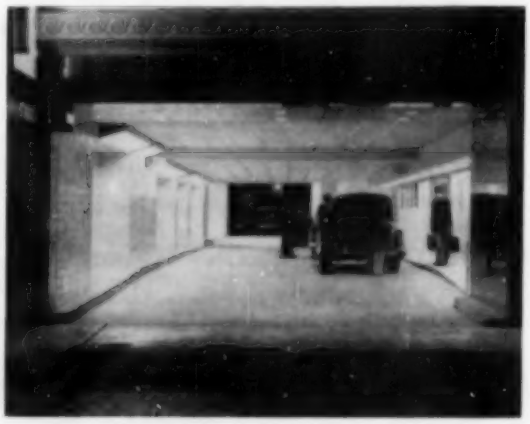
88FT
SCALE 0 4 8 12 16 20 24 FEET
SPECIAL GARCY LUMINAIRE WITH FOUR 96 INCH T-12 LAMPS (OPERATED AT 430 MA) AND EGG-CRATE LOUVER. LAMPS AND LOUVERS ARE TILTED AT 18 DEGREES.
DAYBRITE MOBILEX 2X4 FOOT UNIT WITH THREE 48-INCH T-12 LAMPS (OPERATED AT 430 MA) AND EGG-CRATE LOUVER.
CURTIS #2130 H 200-WATT LOUVERED RECESSED UNIT WITH SILVERED GLASS REFLECTOR.

Figure 3. (above) Plan view of interior.

Figure 4. (below) Close-up of interior.



Architect and engineer: George L. Dahl, Dallas; electrical contractor: McClure Electric Company, Dallas.

Lighting data submitted by Ruth Patterson, Dallas Power and Light Company, Dallas, Texas as an illustration of good lighting practice and to aid in the design of similar installations.

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Series XX 2-55

Electrical distributors' offices frequently must serve two functions—routine office work and the display and demonstration of lighting equipment. Three such areas featured here have installations designed for . . .

Office Lighting and Equipment Display

IN DENVER

ARCHITECTURAL objective for this space was to provide a clear, unobstructed view of the entire area, with the intent that every type of lighting installation within the building would be on display. The entire area is intended as a demonstration facility to enable the owner, a wholesale electrical distributor, to portray a variety of applications for luminous ceilings, to visually illustrate precepts of lighting levels, quality and color, and to serve functionally as a lighting medium for the office in which it is installed.

The louvered grid system which is a major feature of the installation serves also as a large return air grille and at the same time permits this flow of air to dissipate the heat generated above the ceiling.

The 10-foot by 16-foot office shown in this photograph has a 10-foot ceiling, with 7-foot 4-inch free-standing partitions. This area is overspread with a suspended louvered plastic grid ceiling. A combination of open tube strips, and adjustable and fixed incandescent units are installed above the plastic grid ceiling for the demonstration of numerous lighting effects. Lamps used include 48T12 cool white, cool white deluxe, warm white, warm white deluxe, 100-watt inside frost, and 150-watt PAR38's. Each color and type of lamp is spaced and controlled in such a manner as to permit even distribution for the various lighting combinations. A low voltage, master station control system provides for 8191 different lighting combinations. When the entire system is turned on, the lighting level is of the order of 325 footcandles, but functional levels for office work may be separately switched. A valance is installed at the top of the partition in the office area, adding to the vertical illumination level and directing an upward component which reduces the brightness ratio between the luminous ceiling and the adjacent ceiling area. Installation is in the office of Central Electric Supply Co., Denver. Lighting was designed by A. D. Swanson, of Swanson-Rink and Associates and won second prize in the Rocky Mountain "My Most Interesting Lighting Job" contest.

IN OTTAWA

A wide variety of illumination requirements, only one of which is shown here, made the new building of an Ottawa electrical distributor's office the "Most Interesting Lighting Job" of R. L. Lucas, Canadian G.E. His lighting design also made it first-prize winner in the contest conducted by the Ottawa Chapter of I.E.S. The complete design included exterior floodlighting of the modern structure, and interior lighting for auditorium with stage lighting effects, board rooms, selling and display rooms, cafeterias, warehousing areas and offices.

The two offices shown are the large main office, and the district manager's private office, both planned to Recommended Practice. In the private office semi-recessed four-foot fluorescent units are installed on all sides of the room. Matching inserts using 300-watt clear incandescent lamps and control lenses form these into a square pattern. Each pair of fluorescent luminaires is switched separately, and all four of the inserts are independently controlled.

In the general office, a combination of recessed eight-foot slimline troffers with photo-light lenses, and four-foot troffers all on five-foot centers, afford a flexible arrangement here also. The four-foot units (unlighted in the photograph) each have two 48-inch T12 warm white lamps, 430 milliampere series ballasts and are patterned down the center of the room. Separate switching enables their use as a night light, for cleaning and inspection. All switching is by remote control, with luminaires adjacent to windows independently switched. The eight-foot troffers are lamped with two 96T12 warm white lamps and use 430 ma series ballasts. All painted surfaces are light matte gray or blue; average maintained illumination is of the order of 70 footcandles.

Architects for this building were Abra and Balharrie of Ottawa, electrical contractors for the installation were Bedard-Girard Ltd.

IN NEWARK

Originally the new Newark (N. J.) office of Gesco was a warehouse area with trussed roof of two different levels. In the new design, general offices (the area shown) and executive offices were treated individually with several different lighting systems, to demonstrate various equipments.

In the general office the primary objective was to provide good general illumination for office work, using equipment which would demonstrate different low brightness techniques in troffers. The shape of the office is such that different sections may use different troffer luminaires. Toward the entrance troffers with plastic lenses have been installed. In the center of the area, where most of the routine work is done, troffers are equipped with deep Alzak aluminum louvers, and in the rear of the room are equipped with a low brightness prismatic glass lens. The installation was planned to provide 60 footcandles maintained. Initial readings were 80 to 85 footcandles, from a design of continuous troffers on seven-foot centers, using two F96T12 cool white lamps per unit.

A relatively new type of perforated and corrugated aluminum ceiling is used in the installation. This is supplied in six-foot sheets and can be supported by the same rails which support the luminaire. No fixture hangers are used as the flange type troffers simply rest inside on the rails, which are supplied by the ceiling contractor.

Walls are painted a sea-foam green; floor is a gray and reddish brown tile, contributing to the low brightness readings obtained, and excellent contrasts.

The installation was designed by I. J. Chesley, Scotch Plains, N. J.

Attention to all environmental factors, however different the office task, is the inevitable combination for . . .

Modern Offices and Seeing Comfort

BOSTON

An interesting combination of several lighting systems proved effective in the despatching office of the Boston Edison Co., shown here. Continuity of service in this vital area was a prime factor in the method employed. With d-c as well as a-c available, it was planned that the despatch room lighting have 60 per cent of the horizontal illumination on alternating current and 40 per cent on direct current. This would insure at least a workable lighting system under emergency conditions. In the event of both a-c and d-c failure, an automatic throw-over switch to a set of batteries is available for a limited load.

Fluorescent industrial type luminaires having 40 per cent upward distribution are combined in a suitable pattern with silver-bowl diffusers which themselves have a 3 per cent upward component. Diagram board illumination is obtained by a vertical surface lighting unit with lens control located as close to the board as possible to eliminate reflections.

Louvered and adjustable housings, advantageously located and equipped with PAR flood lamps are on the emergency circuit.

Fluorescent luminaires alone deliver 35 ft-c and the incandescent units 25 ft-c for a total of 60 ft-c general illumination after eight months' operation. The diagram board has an average of 40 ft-c in service on the vertical surface from the lens plate lighting alone. General room lighting from the fluorescent and incandescent sources contributes 30 ft-c of vertical illumination for a total of 70 ft-c average over the diagram.

Brightness control, and hence worker comfort, are achieved by the use of a very light gray, 60 per cent reflectance paint on the upper walls; lower walls are a medium gray, 40 RF. Floor tile is 15 per cent reflectance mottled gray. Diagram board is "chalkboard green" at 20 per cent, and desk tops light gray linoleum with a reflectance of 30 per cent.

The installation, designed by R. L. Smart of Boston Edison Co. took first prize in the 1954 contest for "My Most Interesting Lighting Job" conducted by the New England Section of I.E.S.

MILWAUKEE

Seeing, Sound, and Circulation . . . the "three r's" of modern office comfort have been incorporated in this Milwaukee office. The installation is the remodeled auditing department of the First Wisconsin National Bank, which won for Robert M. Johnson of Milwaukee Section, third place in their contest for "My Most Interesting Lighting Job."

One of the factors which made it so interesting to the lighting engineer was the coordination of his problems with those of the architect, acoustical ceiling man and heating and air-conditioning engineer. Their four-way study solved several serious structural problems. Some of these were: an area a block long with a ceiling height of only 10 ft. 3 inches; ducts for 75 tons of air-conditioning; the possibility of frequent rearrangement of desks and office equipment.

Solution is a happy one for all concerned. It hinges on a new ceiling height of 8 feet 8 inches, rows of Alzak aluminum troffers, acoustical tile, air-duct outlets, on a modular plan. All air-conditioning equipment is concealed in the plenum thus formed.

For future space changes, any two windows may be partitioned off without structural changes, and the same level of lighting and air-conditioning still be available to any new offices formed.

Deep parabolic Alzak reflector troffers are spaced three feet on centers and are lamped with single 40-watt T17 low brightness fluorescent lamps. For the seeing part of the combine, careful attention has been given all surfaces and their brightness ratio one with the other. Illumination level is 70 footcandles average. Photograph is the courtesy of Curtis Lighting Inc., Chicago.

SAN FRANCISCO

Multiple problems, or rather their successful solution, are frequently factors in a "most interesting lighting job." Charles W. Macy of Pacific Gas and Electric Co., San Francisco, planned this installation, for the Art Department of the Velvetone Company.

The lighting problem was several-fold, not the least of which was to provide very high levels (85 to 100 ft-c) in low-ceiling offices of almost cubicle size. Further provisions of the installation, in addition to those common with all good current practice, were for a high order of even distribution, minimum reflected glare from desk surfaces, and lighting suitable for color discrimination in silk screen art work.

A vinyl plastic translucent ceiling has been used, shielding 96T12 cool white slimline lamps on 1 ft 3 inch spacing. The cavity is a gloss white; plastic sheeting mounted one foot below the lamps. The new ceiling height is 7 ft 6 inches.

Illumination level after one year averages close to 100 ft-c for horizontal readings; 75 ft-c vertical illumination, with satisfactory brightnesses.

Store Lighting Systems . . . are as varied as the merchandise they illuminate. Principles outlined by Recommended Practice, however, are exemplified in winning installations.

Small store, odd shape, zipped up with engineered lighting effects, equals distinctive sales area. The jewelry store receiving this treatment is Torrey's Jewelers in Rochester, New York; the lighting plan is T. J. Whalen's, of Requa Electrical Supply Inc., Rochester.

Lighting objective for the modernization of this old establishment was: 1. To meet increasing competition for passer-by attention in an area rapidly becoming a very busy and congested business section. 2. To overcome the handicap of a store front having a southeast exposure, thus competing with the sun in the morning and early afternoon. 3. To illuminate floor cases without the assistance of show case lighting, giving an unobstructed view of displayed merchandise. 4. Lastly, to provide window illumination equal to or surpassing any similar installation in the area.

The window is long and narrow — 26 feet to the stairway leading to the optometrist's office, and only 12 feet between wall cases. Ceiling height is 10 feet. Modernization included an acoustical tile ceiling of 74 per cent reflectance, a green tile floor of 22 per cent, refinished side walls above the wall cases of striated plywood stained charcoal color, 20 per cent reflectance.

General illumination was provided by installing seven four-lamp 40-watt fluorescent troffers, provided with plastic louvers having 45/45 shielding, using 40T12 warm white lamps. Four-lamp troffers were used, wired to provide a selection of two- or four-lamp operation. Wall cases are illuminated with concealed two-lamp 40-watt strips behind the top valance. Floor cases are lighted from the ceiling by recessed adjustable downlights using 200-watt PS30 lamps. Candlepower distribution of these units is intensive 16-degree beam to provide the high specular reflection needed for displaying jewelry, silverware and china. They are spaced on 28-inch centers and located nine inches in front of the customer's side of the cases, and tilted five degrees to eliminate reflected glare from glass case top in the customer's direction. These units are adjustable up to 30 degrees and rotate 360 degrees. Each is provided with concentric louvers. Average illumination at case top is 400 footcandles.

STORE LIGHTING SYSTEMS

Incandescent, fluorescent, coves, troffers, niches — all are combined in the layout for this Racine, Wisconsin store. These, however, were primarily tools to give life to an idea. Lighting has been used to suggest different departments in a small area; variations in color and application have provided atmospheres appropriate to the merchandise and transition from one department to another.

The several different types of equipment used in the layout include: Fourteen-foot diameter coves using two rows of neon tubing in the dome and two in the canopy. Large area low brightness panels for general illumination. Recessed louvered downlights using 150-watt R40 floodlamps patterned around the circular coves. Recessed lens bottom accent lights. Recessed glass bottom fluorescent luminaires using standard warm white lamps. Silver-bowl units in a symmetrical pattern suggest another department. Incandescent mirror lights. Illuminated wall niches. Suspended concentric rings.

Adjoining the ladies' wear department, the shoe salon received its own "treatment." Here, a higher level of lighting accented gayer colors of furniture and trim. Recessed louvered incandescent sources over the shoe fitting area minimized color "disappointment." Cooler color of the neon tubing gives a change of pace and a contrasting color to the ceiling. Brightly lighted wall niches draw attention and provide a traffic director from the adjacent department.

The installation was designed for the Eitel Apparel Shop in Racine by Richard Garber of the Wisconsin Electric Power Company. It was awarded second prize in the Milwaukee Section 1954 "My Most Interesting Lighting Job" contest.

STORE LIGHTING SYSTEMS

Relighting older buildings frequently poses the lighting engineer's oddest problems. In the men's clothing store above, Johnson's Inc. in Peoria, there was a full 12-inch difference in ceiling height and a most irregular shape to the rear area, caused by the right wall cutting back at approximately a 45-degree angle.

To unify the differing ceiling heights, the rear ceiling area was painted a flat black and the luminaires suspended on stems to the same level as those at the front. Top plate reflectors direct all light down. The deception is very effective. Rows of luminaires were mounted parallel to the sloping wall and store fixtures also conform to this pattern. The row extending straight back tends to pull floor traffic back and unifies the diagonal rows with those at the front. The rows up front tend to offset the narrow width of the store at that point. Installed levels of illumination were: General floor area, 65 footcandles; under the accent units, 95 footcandles.

Louvered luminaires with top plate reflectors use two 96T12 warm white slimline lamps. Accent units use 200-watt for fixed focus and PAR 36 in the adjustable units. Valances over showcases use warm white deluxe preheat lamps. The wall area above the show case is rose colored and store fixtures are limed walnut.

The interior layout was made by the store owners, the lighting designed by J. W. Brown of the Central Illinois Light Company, Peoria, Illinois. A second-place tie was awarded the installation in the 1954 lighting contest conducted by the Central Illinois Chapter of I.E.S.

Questions and Answers on light sources

The I.E.S. Committee on Light Sources, under the chairmanship of H. F. Davidson, has prepared these answers to questions concerning light sources. Readers are invited to submit similar questions of general interest to be considered for publication. Questions should be sent to the Committee in care of Society Headquarters.

What is the effect on rapid start fluorescent lamps of poor contact between the lampholder and lamp base pins?

Good contact between all lamp pins and their respective lampholder contacts is essential to provide satisfactory operation of rapid start lamps. Lack of good contacts may result in erratic starting or, in extreme cases, very short life. Slow starting usually indicates poor electrical contact.

In the May 1954 issue of your Journal (ILLUMINATING ENGINEERING) there appeared an article by Mr. L. S. Harrison entitled "An Investigation of the Damage Hazard in Spectral Energy." Referring to the data given in this article, would it be possible to conclude that the "deluxe" fluorescent lamps will cause a more rapid yellowing of the plastics commonly used for lighting diffusers (especially polystyrene) than would the standard warm white or cool white lamps?

To conclude from the article referred to above that "deluxe" fluorescent lamps will cause more yellowing of plastics than "standard" fluorescent lamps may be much in error. This conclusion assumes that the plastic has the same "spectral damage characteristics" as shown in Table I of the article (which is for low grade paper). Although "deluxe" fluorescent lamps have more radiation in the near ultraviolet region than the "standard" fluorescent lamps, there does not appear to be sufficient data given in the article to justify the assumption that the "spectral damage characteristics" of the plastic will be as shown in Table I.

Is there any change during life, in the color of the light from fluorescent mercury sources known as "color corrected" or "color improved" lamps?

The fluorescent mercury lamp is provided with a phosphor coating on the inside surface of the outer bulb in order to provide red radiation to make up for the deficiency of this color in the mercury arc spectrum. The phosphor used in most fluorescent mercury lamps manufactured in the United States shows no appreciable change in color during the life of the lamps.

What are some of the economic considerations in using daylighting as compared to electric lighting from an air conditioning point of view?

The large number of variables requires individual economic studies for each case. Some of the factors that should be considered are heat loss from windows, heat gain from windows, time of day area is used, orientation of building and geographical location of building.

Is there any advantage in using fluorescent lighting or mercury lighting over incandescent filament lighting from an air cooling point of view?

Fluorescent lamps and mercury lamps offer a definite advantage over incandescent filament lamps from an air cooling viewpoint. Due to their higher luminous efficiency a lighting level two or three times higher is possible for the same air cooling load.

Materials for Light Control

Report of the I.E.S. Committee on Light Control and Equipment Design

THE COMPILATION of a Table of Data on the Materials of Light Control has been this Committee's assignment. The compilation includes data which the Committee has felt would be an aid to those who may become involved in the selection or appraisal of materials for the control of artificial light (this restriction because building materials are not considered).

Certain critical precautions must be taken in the selection of adequate materials. These precautions are considered in part by the categories of characteristics used to give survey information. The qualifications in these categories have been arranged with this in mind and all obvious precautions have been taken.

In certain tabulations specific data are given. These data have been compiled over a period of six years from scientific and commercial sources and are presented without bibliographic references. However, they are set forth with the Committee's explicit statement that final reference should be made to manufacturers' data.

Respectfully submitted,

COMMITTEE ON LIGHT CONTROL AND EQUIPMENT DESIGN

D. L. Williams, *Chairman*

G. R. Baumgartner	M. P. Morse
B. S. Benson, Jr.	F. M. Neal
R. D. Bradley	C. N. Sprankle
C. G. Moore	F. C. Winkler

Approved by the I.E.S. Council, October 1954.

Table of Materials and

I	II Principal Use (1)	III Available Forms	IV Reflectance	V Transmittance (2)	VI Index of Refraction	VII Maximum Clarity	VIII Colors Possible	IX Character of Emitted Light (3)
ALUMINUM		(12)						
Mill Finish	RL S	R	50-70%				Aluminum	Semi-Diffuse
Unpro cessed Specular	RL S	R	60-70%				Aluminum	Regular
Unprocessed Etched	RL S	R	50-60%				Aluminum	Diffuse
Processed Specular	RL S	R	80-85%				Aluminum to any	Regular
Processed Etched	RL S	R	75-80%				Aluminum to any	Diffuse
GLASS	(11)							
Soft (9)	RL RR S G L	BMPRSU	(13)	(13)	1.50-1.54	Water Clear	Unlimited (14)	Regular to diffuse
Hard	RR G L	BMPRSU	(13)	(13)	1.47-1.51	Water Clear	Limited (15)	Regular to diffuse
High Silica	RR G L	BMPU	(13)	(13)	1.45	Water Clear	Clear	Regular
Tempered	RR G L	PSU	(13)	(13)	1.47-1.55	Water Clear	Clear to Unlimited	Regular to diffuse
Opal	RR S G	BPR	20-80%	67-4%	1.50	Translucent	White	Regular to diffuse
Decorative (10)	S G	PRU	6-80%	80-6%			Unlimited	Diffuse
Colored Soft	RR G L	BPU	(13)	(13)	1.50-1.59	Clear	Limited	Regular to diffuse
Colored Hard	RR G L	BPU	(13)	(13)	1.48-1.51	Clear	Limited	Regular to diffuse
PLASTIC (.060"-.110" SMOOTH FLAT STRIP) (16)								
Polystyrene (Cast)	RL S RR	RE	5-85%	90-10%	1.59-1.60	Water Clear	Unlimited	Regular to diffuse
Polystyrene (Extruded)	RL S	E	10-80%	85-15%	1.59-1.60	Water Clear	Unlimited	Regular to diffuse
Methyl Methacrylate (Cast) (18)	RL RR S L	R	8-85%	90-10%	1.49	Water Clear	Unlimited	Regular to diffuse
Methyl Methacrylate (Extruded) (18)	RL S	E	8-85%	90-10%	1.49	Water Clear	Unlimited	Regular to diffuse
Rigid Vinyls (Cast) (27)	RL S RR	PRU	15-80%	80-15%		Near Clear	Unlimited	Regular to diffuse
Rigid Vinyls (Extruded) (27)	RL S RR	E	30-75%	60-15%		Near Clear	Unlimited	Regular to diffuse
Urea Formaldehyde (Molded)	RL S RR	P (Molded)	55-70%	40-15%	1.54-1.56	Translucent	Unlimited	Regular to diffuse
Polyester Laminates (Cast)	RL S RR	MPU	30-75% (38)	55-10%		Translucent	Unlimited	Mixed
APPLIED COATING								
Synthetic Enamel (32)	RL S	Liquid-Spray, Brush	10-90%			Clear	White & Unlimited	Mixed to diffuse
Lacquer	RL S	Liquid-Spray, Brush	10-85%			Clear	White & Unlimited	Mixed to diffuse
Aluminum Paint (Lacquer)	RL S	Liquid-Spray, Brush	25-50%				Aluminum	Mixed to diffuse
Aluminum Paint (Synthetic)	RL S	Liquid-Spray, Brush	15-45%				Aluminum	Mixed to diffuse
Porcelain Enamel (Gloss)	RL S	Liquid-Spray, Dip	10-92%				White & Unlimited	Diffuse-Specular
Porcelain Enamel (Mat)	RL S	Liquid-Spray, Dip	10-82%				White & Unlimited	Diffuse
Chrome Plate (Polished)	RL	Plating Process	66%				Fixed	Regular
Chrome Plate (Satin)	RL	Plating Process	47%				Fixed	Diffuse
Nickel Plate (Polished)	RL	Plating Process	63%				Fixed	Regular
Nickel Plate (Satin)	RL	Plating Process					Fixed	Diffuse
Silver Plate (on Metal) (39)	RL	Plating Process	93%				Fixed	Regular
Silver Plate (on Glass)	RL	Plating Process	90%				Fixed	Regular
Rhodium Plate (on Metal)	RL	Plating Process	78%				Fixed	Regular

(Bracketed numbers indicate references for table — top of page 99.)

References: I.E.S. Lighting Handbook, Illuminating Engineering Society, New York, 1952.
Plastics Property Chart, Modern Plastics Encyclopedia & Eng. Handbook, Plastics Catalogue Corp., New York.
Technical Data on Plastics, Plastics Materials Mfg. Assoc. Inc., Washington, D. C.

References for Table on Materials and Finishes.

1. Principal use: RL — reflector; RR — refractor; S — shield; G — globe; L — lens (pressed, ground or polished).
2. Refer to manufacturers' catalogues for spectral characteristics.
3. Refer to I.E.S. Standard Nomenclature, section 30 on Materials and Accessories Modifying Distribution of Light.
4. Columns of properties without figures giving comparisons should be considered relative for each material group only and should not be compared directly with other material groups.
5. The impact resistance depends on the size, shape, thickness and surface condition of the item; method of holding item, and object used in delivering impact.
6. Working temperatures (normal and extreme limit).
7. Special attention should be given to atmospheric conditions.
8. Temperature limits of column No. XI apply.
9. Soft Glass: Soda lime and lead glasses.
10. Decorative Glass: Alabaster, cased, enameled, etc., i.e., enameled clear glass for torcheres.
11. Refer to I.E.S. Standard Nomenclature, sub-section 30.2 on Illuminating Glasses.
12. Forms: B — blown ward; M — multiform; P — pressed ware; R — rolled sheet; S — plate glass; U — panels; E — extruded forms. (for Opal Glass; MR cased or solid).
13. Glass generally may be assumed to have a 4 per cent light loss at each air-glass surface due to reflectance; additional reduction of transmittance depends upon absorptance and total internal reflection, and varies with variation in commercial quality.
14. By decoration.
15. Limited to type of applied decoration.
16. Tempered glass will fail from excessive heat approaching the flow point since temper is removed.
17. Depends on applied decoration.
18. Consideration should be given to electro-static characteristics.
19. Only plastics recommended for outdoor use.
20. For vinyls both high and low temperatures are critical.
21. Heat distortion point ASTM Spec. D648-44-T.
22. Dependent on stability of base material.
23. Protection required.
24. 20 to 60 inch pounds.
25. H-5H pencil hardness.
26. Less than ¼-inch rust creepage in 260-410 hours standard salt spray.
27. If on back of glass and protected.
28. 90 per cent transmittance possible when glass mat is used for reinforcement.

Finishes for Light Control.

X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
	Resistance (4)			Stability (4)			Permanence	Thermal Shock
Impact (5)	Heat (6)	Mar	Corrosion (7)	Light	Dimension (8)	Flammability	(4) (7)	Resistance (8) (4)
Excellent	300-500 F	Poor	Poor	Excellent	Excellent	None	Poor	Excellent
Excellent	300-500 F	Poor	Poor	Excellent	Excellent	None	Poor	Excellent
Excellent	300-500 F	Poor	Poor	Excellent	Excellent	None	Poor	Excellent
Good	300-500 F	Fair	Excellent	Excellent	Excellent	None	Excellent	Excellent
Good	300-500 F	Fair	Excellent	Excellent	Excellent	None	Excellent	Excellent
Good	110-450 C	Good	Good-Excellent	Excellent	Excellent	None	Excellent	Fair
Good	230-475 C	Excellent	Good-Excellent	Excellent	Excellent	None	Excellent	Good
Good	300-1100 C	Excellent	Excellent	Excellent	Excellent	None	Excellent	Excellent
Excellent	250 C (16)	Good	Good-Excellent	Excellent	Excellent	None	Excellent	Good
Good	110-450 C	Good	Good-Excellent	Excellent	Excellent	None	Excellent	Fair
Fair-Good	110-450 C	Fair-Good (17)	Fair-Excellent (17)	Excellent	Excellent	None	Excellent	Fair
Good	110-450 C	Good	Good-Excellent	Excellent	Excellent	None	Excellent	Fair
Good	110-475 C	Excellent	Good-Excellent	Excellent	Excellent	None	Excellent	Good
	(21)							
Fair-Good	160-210 F	Good		Fair-Excellent	Excellent	Slow Burn	Fair	Good-Excellent
Fair-Good	160-210 F	Good		Fair-Excellent	Excellent	Slow Burn	Fair	Good-Excellent
Good	150-210 F	Good		Fair-Excellent	Good	Slow Burn	Good	Good-Excellent
Good	163-196 F	Good		Fair-Excellent	Good	Slow Burn	Good	Good-Excellent
Good-Very Good	142-153 F	Good		Good-Very Good	Fair-Poor	Self-Extinguishing	Good	Poor-Fair
Good-Very Good	142-153 F	Good		Good-Very Good	Fair-Poor	Self-Extinguishing	Good	Poor-Fair
Good	170 F	Good		Good	Fair	Very slow burning	Good	Excellent
Excellent	200-250 F	Good		Good	Good	Slow to Self-Extinguishing	Good	Excellent
(22)	(22)	(22)	(22)		(22)		(22)	(22)
Good (24)	200-500 F	Fair (25)	Fair (26)	Good	Excellent	Slow Burn	Good	Good
Fair	150-200 F	Poor	Poor	Fair-Poor	Excellent	Slow Burn	Fair	Good
Fair	150-175 F	Poor	Poor	Fair-Poor	Excellent	Slow Burn	Fair	Good
Good (24)	225-1000 F	Fair (25)	Fair (26)	Good	Excellent	Slow Burn	Good	Good
Fair	to 1000 F	Excellent	Excellent	Excellent	Excellent	None	Excellent	Excellent
Fair	to 1000 F	Excellent	Excellent	Excellent	Excellent	None	Excellent	Excellent
Excellent	Excellent	Excellent	Excellent	Good	Excellent	None	Excellent	Excellent
Excellent	Excellent	Excellent	Excellent	Good	Excellent	None		Excellent
Excellent	Excellent	Good	Good	Good	Excellent	None		Excellent
Excellent	Excellent	Good	Good	Good	Excellent	None		Excellent
Excellent	Excellent	Poor	Poor	Excellent	Excellent	None	Poor	Excellent
Excellent	Good	Poor	Excellent (27)	Excellent	Excellent	None	Poor-Excellent (27)	Poor
Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	None	Excellent	Excellent

Here and There with I.E.S. Members

TV interview of Dr. E. F. Lowry, I.E.S. Gold Medallist, and Hamilton Ontario Chapter Chairman Norman W. Bethune was held by Station CHCH-TV. Interviewer is Miss Teddy Forman. Dr. Lowry was guest speaker at the joint meeting, November 15, of the Hamilton Chapter with the Toronto Section of I.E.S., at which there was a record attendance of over 200.

Annual joint meeting of the Michigan Section and the Michigan Residence Lighting Forum was held December 14 at the Detroit Yacht Club. Here Program Chairman Miss Frances Rosier (left) chats with Mrs. Maraquita Dygert and guest speaker Miss Gladys Miller (right). Miss Miller, who is decorating and merchandising consultant for General Electric's Lamp Division, spoke on "Light for Living."

Attendance of 58 at the basic course on illumination fundamentals held by the New York Section of I.E.S. was comprised of architects, lighting designers, utility lighting cadets, industrial and fixture manufacturers' representatives, jobbers, consulting engineers and municipal engineers. The 12-week course had a faculty of R. L. Zahour, Westinghouse Lamp Division; L. R. Anderson, General Electric Lamp Division. Lou Goren, Smithcraft Lighting Division and G. G. Rae, Holophane Co.

Featured speaker at the November 18 meeting of the St. Louis Section was C. L. Crouch, I.E.S. Technical Director. At the head table are: l. to r., O. S. Wilkins, Program Chairman; R. M. Krick, Jr., Public Relations Chairman; L. M. Wallace, Past Chairman of the Section; Mr. Crouch; Brooks Chassaing, Section Chairman; John Rhoades, Board of Managers; W. C. Young, MMILJ Contest Chairman; Charles Zurheide, Membership Chairman; and R. J. Welsh, Section Secretary.

T E L E C A S T

LIGHTING NEWS OF CURRENT INTEREST

"Plastics for Lighting" Committee Sets Up Standardization Goals

The joint Committee on Plastics for Lighting, composed of representatives from I.E.S., The Society of the Plastics Industry and the National Electrical Manufacturers Association, met November 12 in Cleveland to continue work concerned with the compiling of standards for plastics when applied to lighting. Retiring Chairman Eric H. Church, Benjamin Electric Mfg., presided.

Incoming Chairman F. C. Winkler, Westinghouse Electric Corp., pointed up the needs for an educational program and for the compilation of standards on plastics as applied to lighting, saying consumer reaction to plastics in certain fields is not good.

A Steering Committee was appointed, with F. C. Winkler, Chairman, and representatives from the plastics industry, the testing laboratories and fixture manufacturers. Three subcommittees were also appointed and assigned the work of compiling standards. These are:

General Requirements — George Gilleard, Curtis Lighting Co., Chairman. This subcommittee is to decide what is needed in the way of standards on plastics applied to lighting, and will be charged with producing a set of standards. The actual labeling of a product, however, is to fall under the jurisdiction of the main Steering Committee.

Properties and Measurements — E. A. Haddad, Monsanto Chemical Co., Chairman. This subcommittee will detail the various physical properties to be included in the standard and the various measurements and terminology to be used.

Maintenance — F. W. Ogden, The Miller Co., Chairman. As its name implies, this subcommittee is to set up standards for the use and maintenance of plastics for lighting.

There was much discussion on the various instruments now being developed for measurement of light transmission and the possibility of setting up a standard method. Several times throughout the meeting the problem of yellowing and aging was brought up as being one of the principle problems in the industry, although it is recognized that it may be a long-range study to arrive at definite conclusions.

A preliminary report was made on the findings of the Maintenance Committee, dealing with cleaning and destaticizing of extruded, molded, cast or sheet type plastics.

The organization of a cooperative Committee with the Underwriters' Laboratory was the final business. This Committee, with J. S. Capps of UL as Chairman, will act as a liaison group between the plastics and lighting industries and the Underwriters.

Featured Speakers Announced for Street Tree & Utility Conference

The final program for the Street Tree and Utility Conference, to be held at Wade Park Manor, Cleveland, has been completed. Keynote speaker will be the Honorable Thomas A. Burke, former Mayor of Cleveland and president of the United States Conference of Mayors, who will give the address on "Our Streets Can Be Beautiful — and Useful."

The opening address on "1954 Hurricanes Pin-Point the Need for Long-Range Coordinated Programs" will be presented by John L. Rego, Director of Agriculture and Conservation of the State of Rhode Island.

The conference program (for details, see January I.E., page 12A) consists of four sessions — Why, Design, Examples of Coordination, and a Forum. Also announced in the final program are the four contributors to the discussion on pole lines in the session on Examples of Coordination. These are: Russ Hickok, Connecticut Light and Power Co., Berlin, Conn.; G. J. Vaupel, New Jersey Bell Telephone, Newark, N. J.; E. G. Stahl, Pacific Gas and Electric Co., San Francisco, Calif.; and H. T. Sealy, Cleveland Electric Illuminating Co., Cleveland, Ohio.

Home Lighting Workshop Sponsored By Michigan Lighting Forum

A Home Lighting Workshop, designed to give help with the every-day problems of builders, architects, electrical contractors, interior decorators and teachers, was sponsored February 2 by the Residence Lighting Forum of the Michigan Section, I.E.S. The meeting was held in the Sales Auditorium of the Detroit Edison Co., Detroit.

The group was welcomed by Miss Frances Rosier, Forum Chairman, and opening remarks were made by E. J. Hurley, Supervisor of Promotion with Detroit Edison. The program then included:

The Story of Light — a technicolor film.

Analysis of Light for Family Living — Mary Webber, General Electric Co., Cleveland.

Solution of Specific Visual Problems — James Jensen, General Electric Co., Cleveland.

Luncheon — at the Cafeteria of Detroit Edison Co.

Analysis and Performance of Lighting Fixtures — Mary Taepke, Detroit Edison Co., Detroit.

Architectural and Built-In Lighting Effects — Robert B. Wylie, Sylvania Electric Products, Inc., New York City.

Program Chairmen for the full-day meeting were Miss Kathryn Riney and Miss Mary Taepke.

First Certified Installation In Fall River, Mass., Police Station

The first industrial and commercial lighting certification — under the Certified Lighting Program of the National Lighting Bureau (NEMA) was conferred December 22, 1954, for an installation in the Fall River, Mass., Police Department. The completion and hanging of the Certificate of Conformance to Illumination Standards, and the affixing of the decalcomania of Certified Lighting, were witnessed by municipal and electric lighting industry leaders, at Police Headquarters. Also present were officers of the Certified Lighting Bureau of the Electrical League of Rhode Island.

The installation was made in the Traffic Division for Tickets, in the Central Station of the Fall River Police Department. Faced with the necessity of read-

FIRST installation to receive certification under the Certified Lighting Program of the National Lighting Bureau is the Traffic Division of the Fall River, Mass., Police Department. Here Captain Albert E. Blanshard (right rear) confers with one of his staff under the new lighting installation. Two rows of five 2-lamp semi-direct luminaires, using 40T12 cool white lamps, provide 50 footcandles maintained (75 initial). Units are mounted 18 inches from the 11-foot-high ceiling, six feet apart in the 22 x 11-foot area. Ceiling reflectance is 75 per cent; wall reflectance 50 per cent.

ing and filing various colored tickets, each bearing writing in pencil or carbon, officers of that division had complained of eyestrain while working under the old lighting, with consequent dissatisfaction, errors and slowing of work. When the contractor, George A. Bishop, President, Crawford Electric Co., checked the old installation, he could not get any reading from a footcandle meter at table level — and only ten footcandles when he held it above head level. With the repainting of walls and ceiling and the installation of new luminaires, Mr. Bishop reports 50 footcandles reading on working surfaces.

Mr. Bishop reports that in the re-lighting installation he applied both the technical and sales information he gained as a student of the training course conducted by the Rhode Island Certified Lighting Bureau. Geared to the concept that the electrical contractor is the man on the firing line of lighting sales, the National Lighting Bureau program is designed to give training in selling and in laying out lighting installations that will meet its standards. The program operates through local lighting bureaus, electrical or lighting industry committees drawn together for that special purpose. Chairman of the Executive Committee of the Certified Lighting Bureau of the Electrical League of Rhode Island is W. I. Colson, Rhode Island Chapter Manager of the National Electrical Contractors Association.

Second Certified Lighting Program Planned for Boston Area

A Certified Lighting Program is being inaugurated in the Boston area, by the Electric Institute, Inc., which has its offices in that city. The operation will be carried on by the Lighting Committee of the Electric Institute, in accordance with the plans of the National Lighting Bureau.

Chairman of the Lighting Committee of the Electric Institute is Julius Daniels, Assistant to the Commercial Manager, Boston Edison Co., and a Past-President of the I.E.S. Certification authorities have been established in the offices of the electric light and power companies of the area. Committees have been organized for the execution of the operation details, and the training classes for lighting salesmen are planned to begin in March.

Wiring Conference To Study Home Wiring Today

If America's old house wiring is ever to catch up with the rapid multiplication of home appliances and high lighting levels demanded by today's electrically operated existence, it will probably have to be accomplished through time payment buying of new expanded wiring systems, says *Nema News*, in their December 28 issue.

This prediction, made by L. E. Barrett, Plan Committee Chairman, National Adequate Wiring Bureau, New York City, was coupled with the announcement of the 11th Annual Wiring Conference, being held February 24-25 in Chicago. General Conference Chairman is Don E. Clayton, president of the National Electrical Contractors Association.

One main topic to be discussed at the conference is 1955 residential wiring standards, effective January 1, with a panel of members of the Residential Wiring Subcommittee of the Industry Committee on Interior Wiring Design; FHA and the 100-ampere Service, a panel discussion with an electrical contractor, a builder, and an FHA Regional Director, under the chairmanship of Roger B. Kellogg, Electric Association of Chicago Adequate Wiring Committee.

J. O. Covington, manager, Consolidated Edison Co. Adequate Wiring Bureau, New York City, and T. L. Hankins, co-chairman, Commercial Industrial Elec-

Open Letter to I.E.S. Members

The I.E.S. Research Planning Committee has been asked to serve as a clearing-house for projects on illumination and light and vision. If you have a project which you think needs investigation, please send your suggestion to the Committee Chairman, or to C. L. Crouch, I.E.S. Technical Director.

Likewise, if you need a suggestion, perhaps for a college thesis subject, apply in the same way to the

RESEARCH PLANNING COMMITTEE
Willard Allphin, *Chairman*

S. K. Guth — R. C. Putnam
H. L. Logan — D. E. Spencer

trical Usages Committee, Electric Association of Chicago will present experience stories on apartment house wiring modernization. Rounding up the Friday morning program will be L. R. Klose, II, L. R. Klose Electric Co., Kalamazoo, Mich., distributor.

An afternoon open forum will continue until 4 p.m.

1955 Program Announced By Chicago Lighting Institute

The series of clinics and courses scheduled for 1955 by the Chicago Lighting Institute, in cooperation with the Chicago Section of I.E.S. and the Illinois Institute of Technology, have been announced. In addition to the annual lecture-laboratory courses in Lighting Fundamentals, with Raymond Wozniak and James Burke as instructors, six clinics are being offered. Artificial Light in Photography, the first of these, is being held February 7 through 12. The other clinics, for which dates will be announced later, will be on Lighting in Schools, Industry, Railroad Properties, Office Buildings, and the Home.

The winter program also includes Wiring Design No. 1, under Frank R. McShane, which will be continued in the Fall with Wiring Design No. 2A.

Further information on tuition and dates for the courses and clinics may be obtained from the Chicago Lighting Institute, 37 South Wabash Ave., Chicago.

St. Louis Section Activities — From Atoms to Christmas Lighting

In addition to its regularly scheduled monthly meetings, the activities of the St. Louis Section of I.E.S. have recently broadened in civic and technical responsibilities. Participation by the Section in the Outdoor Christmas Lighting Contest of St. Louis gave the preliminary judging of displays the authority of illuminating engineers. The Christmas lighting contest is presented by the St. Louis Globe Democrat in cooperation with a civic committee.

The Section also participated November 17 in a Conference on Science, Invention and the Atomic Future, as one of the technical associations which were cooperating sponsors. The Conference was called by the National Association of Manufacturers, the Associated Industries of Missouri and the Chamber of Commerce of Metropolitan St. Louis. Brooks Chasning, St. Louis Section Chairman, attended the banquet and afternoon session representing I.E.S.

(Continued on the next page)

LIGHTING CALENDAR

Society Events

February 10, 1955—Meeting of I.E.S. Council, New York, N. Y.

March 31 - April 1, 1955 — Southern Regional Conference, Ft. Harrison Hotel, Clearwater, Fla.

April 3-5, 1955 — Southwestern Regional Conference, Gunter Hotel, San Antonio, Texas.

April 11-13, 1955 — Inter Mountain Regional Conference, Westward Ho Hotel, Phoenix, Arizona.

April 14-15, 1955 — South Pacific Coast Regional Conference, Statler Hotel, Los Angeles, Calif.

April 25-26, 1955 — Pacific Northwest Regional Conference, Harrison Hot Springs Hotel, Harrison Lake, B. C.

May 2-3, 1955 — Midwestern Regional Conference, Edgewater Beach Hotel, Chicago, Ill.

May 12-13, 1955 — Canadian Regional Conference, Hotel Mount Royal, Montreal, Que.

May 19-20, 1955 — East Central Regional Conference, Abraham Lincoln Hotel, Reading, Pa.

June 10-11, 1955 — Northeastern Regional Conference, Ft. William Henry Hotel, Lake George, N. Y.

September 12-16, 1955 — Illuminating Engineering Society, National Technical Conference, Hotel Statler, Cleveland, Ohio.

Industry Events

February 14-17, 1955 — National Rural Electrical Cooperative Association, Annual Meeting, Atlantic City, N. J.

March 13-18, 1955 — National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.

March 28-31, 1955 — Edison Electric Institute, Sales Conference, Edgewater Beach Hotel, Chicago, Ill.

April 5-7, 1955 — Progress in Electrical Equipment Exhibit, Municipal Auditorium, St. Louis, Mo.

April 6-7, 1955 — Electrical Maintenance Conference, University of Southern California, Los Angeles, Calif.

April 17-22, 1955 — Society of Motion Picture and Television Engineers, 77th Semi-annual Convention, The Drake Hotel, Chicago, Ill.

May 10-12, 1955 — Chicago Electrical Industry Show, Conrad Hilton Hotel, Chicago, Ill.

May 11-13, 1955 — Pacific Coast Electrical Association, Inc., Annual Convention, Palace Hotel, San Francisco, Calif.

May 12-13, 1955 — Public Utilities Advertising Association, Annual National Convention, Sheraton Hotel, Chicago, Ill.

May 22-25, 1955 — National Association Electrical Distributors, 47th Annual Convention, Conrad Hilton Hotel, Chicago, Ill.

June 13-16, 1955 — Edison Electric Institute, Annual Convention, Los Angeles, Calif.

June 20-24, 1955 — American Society for Engineering Education, Pennsylvania State University, State College, Pa.

June 27 - July 1, 1955 — American Institute of Electrical Engineers, Summer General Meeting, New Ocean House, Swampscott, Mass.

June 13-15, 1955 — Western Plant Maintenance and Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif.

August 15-19, 1955 — American Institute of Electrical Engineers, Pacific General Meeting, Butte, Montana.

September 27-29, 1955 — Electrical Progress Show, Convention Hall, Philadelphia, Pa.

October 3-5, 1955—National Electronics Conference, Hotel Sherman, Chicago, Ill.

October 3-7, 1955 — Society of Motion Picture and Television Engineers, 78th Semi-annual Convention, Lake Placid Club, Essex County, N. Y.

October 3-7, 1955 — American Institute of Electrical Engineers (Fall General Meeting), Morrison Hotel, Chicago, Ill.

October 5-7, 1955 — Canadian Electrical Manufacturers Association (11th Annual Meeting), Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.

October 11-14, 1955 — National Electrical Industries Show, 69th Regiment Armory, New York, N. Y.

October 17-21, 1955 — National Safety Council, 43rd National Safety Congress & Exposition, Chicago, Ill.

October 24-26, 1955 — 37th Annual Meeting and Sixth National Conference on Standards, American Standards Association, Washington, D. C.

October 30, 1955—Week of—National Electrical Contractors Association, Waldorf-Astoria, New York, N. Y.

November 1-3, 1955 — Fifth Industrial Electric Exposition, Hotel Wm. Penn, Pittsburgh, Pa.

November 14-18, 1955 — Chicago Exposition & Power and Mechanical Engineers ASME, Chicago Coliseum, Chicago, Ill.

A LISTING OF THE SUSTAINING MEMBERS OF I.E.S. IS ON PAGES 19A, 20A, 22A, 24A, OF THIS ISSUE.

Even in its monthly meetings, the Section provides an avenue for its members to become better acquainted with members of other professions. Under the plan inaugurated in 1952, each year one of its regular meetings is set aside for the specific purpose of having as guests, either architects and consulting engineers or electrical contractors. A special committee has as its purpose that of encouraging a large attendance with guests from school official groups and electrical contractors.

FACULTY members and registered conferees at the Illumination Institute, December 13-14, sponsored by the Milwaukee Section of I.E.S. and the University of Wisconsin Extension Division. Left to right, front row: J. Reiland, C. F. Jensen, W. B. Kennedy, A. Bandow, R. Hinkelman, E. March, R. F. VandenBoom, G. Kammerer, R. Knoff and R. D. Smith; second row: J. Eggleston, O. Ahrens, D. Culver, H. Anderson, J. J. Burke, R. Cheney, R. Johnson, and A. Schoen; back row: C. Lang, C. L. Crouch, A. Rydstrom, S. Kapitan and F. Fosdal.

Winners Announced in Jubilee Lighting Competition

Winners in Light's Diamond Jubilee Lighting Competition for electrical contractors, sponsored by *Electrical Construction and Maintenance*, McGraw-Hill publication, in conjunction with the 75th anniversary of the first electric lamp, have been announced.

An international contest, it gave 17 cash awards totalling $1,350 and five honorable mention awards to electrical contractors in ten states and Canada. Pennsylvania held first place with a total of seven prize winners and two honorable mentions. Two awards went to Canada.

The contest was aimed "to foster and encourage outstanding lighting installations by electrical contractors and to stimulate industry interest and activity toward the further progress of electrical illumination."

Initiative used in promoting new and improved lighting jobs in stores, schools and offices, industry, residence, flood lighting and miscellaneous jobs for churches, banks, theaters and other buildings was stressed. Each entry covered a lighting installation completed between August 1, 1953 and December 1, 1954. First prize award in each category is $100; second, $75 and third, $50.

Contest judges were: Richard Kelly, illumination design consultant, New York City; Thomas F. Coghlan, illuminating engineer, Public Buildings Services, Washington, D. C.; and C. L. Crouch, Technical Director, I.E.S.

Winners in the six categories were:

Stores

First — Milton W. Stratton, Independent Wiring Co., Philadelphia, Pa.
Second — Robert E. Walton, Sweney Electric Co., Inc., Gary, Ind.
Third — Courtland W. Frick, Electrical Contractor, Glenside, Pa.
Honorable Mention — R. M. McKenzie, McKenzie Electric Co., Chattanooga, Tenn.

Schools and Offices

First — John O. Kvalsten, Kvalsten Electric Co., Inc., Minneapolis, Minn.
Second — W. H. Axelson, Axelson Electric Co., Youngstown, Ohio.
Third — W. H. Axelson, Axelson Electric Co., Youngstown, Ohio.
Honorable Mention — F. R. Haubelt, Haubelt Electric Co., Pittsburgh, Pa.

Industrial

First — J. G. Zimmerman, Zimmerman & Walsh, Quarryville, Pa.
Second — A. D. Miller, Canadian Comstock Co., Ltd., Ottawa, Ont.
Third — C. A. Holm, Electrical Contractor, Prospect Park, Pa.

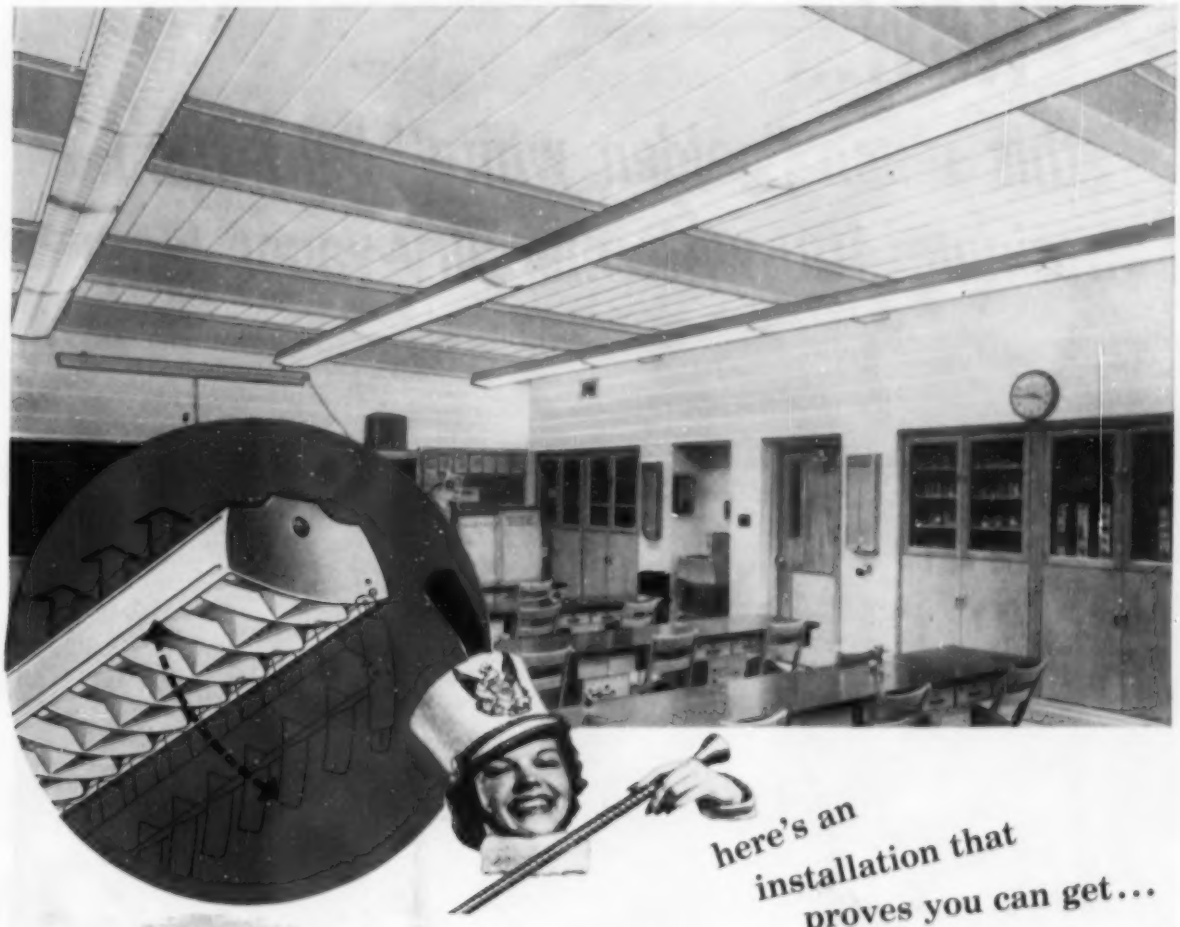
Residential

First — Jerry F. Burt, Burt Electric Co., Fallbrook, Calif.
Second — Kenneth A. Johnson, Johnson Electric Co., Cokato, Minn.

(Continued on page 13A)

I.E.S. Regional Conferences—1955

Southern	Fort Harrison Hotel Clearwater, Florida	March 31-April 1
Southwestern	Gunter Hotel San Antonio, Texas	April 3-5
Inter-Mountain	Westward Ho Hotel Phoenix, Arizona	April 11-13
South Pacific Coast	Statler Hotel Los Angeles, California	April 14-15
Pacific Northwest	Harrison Hot Springs Hotel Harrison Lake, British Columbia	April 25-27
Midwestern	Edgewater Beach Hotel Chicago, Illinois	May 2-3
Canadian	Mount Royal Hotel Montreal, Quebec	May 12-13
East Central	Abraham Lincoln Hotel Reading, Pennsylvania	May 19-20
Northeastern	Fort William Henry Hotel Lake George, New York	June 10-11



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1—EMBOSSED SIDES AND FORMED CHANNEL—for extra strength and rigidity.

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3—SIMPLIFIED INSTALLATION—all units are designed for individual or continuous line installation, without the use of special couplers.

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6—EASIER TO KEEP CLEAN—lack of large area horizontal surfaces prevents accumulation of dirt.

ALL 6 MODERN LIGHTING FEATURES in a low cost unit!

Streamlined, simplified "Varsity" lighting units prove that a limited budget need not limit the lighting quality. In schoolrooms and in many types of commercial and semi-industrial locations, these Benjamin Leader Line fluorescent fixtures are delivering the kind of light ordinarily associated with much higher priced units. With their simplified construction, Benjamin is able to offer at low cost a unit providing scores of quality features relating to operation and maintenance. Six of the most important ones are listed here.

To assure rock-bottom operating cost, "Varsity" Units use high light output 4′ or 8′ Slimlines, as well as 40-watt Rapid-Start, 40-watt Pre-heat, or 8′ Rapid-Start lamps. For full "Varsity" details, send for Bulletin AD 6311. Address Benjamin Electric Mfg. Co., Leader Div., Dept. I, Des Plaines, Illinois, makers of famous Benjamin and Leader Line Lighting Equipment and Sound Signals for Industry, Commerce and Institutions. *(Exclusive licensee of the Leader Line in Canada: Robertson Irwin Limited, Hamilton, Ontario.)*

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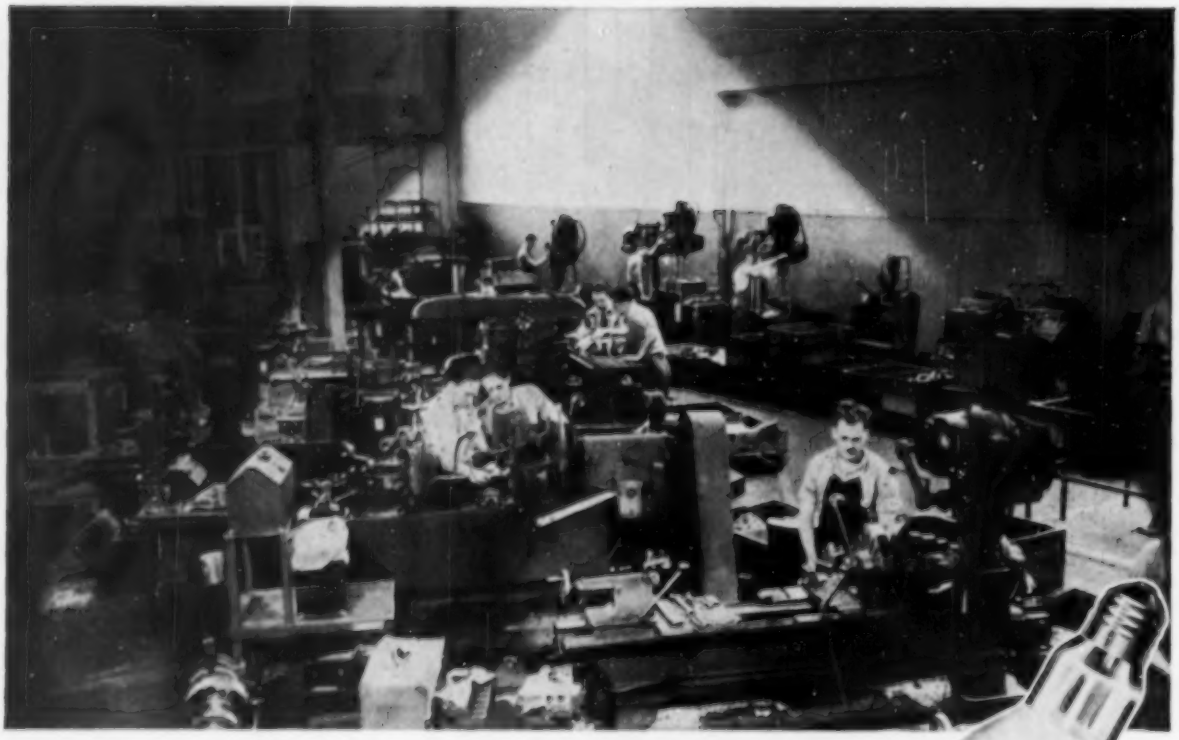
NOW...

this much "golden white" light from a single 400-watt mercury-vapor lamp



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HERE'S THE LAMP that opens new vistas in lighting . . . SYLVANIA'S new, color-improved mercury-vapor lamp, type J-H1.

With this new lamp, you get more "golden white" light . . . without the color distortions you expect from a clear mercury lamp . . . 18,000 lumens of "golden white" light . . . in a lamp that lasts over two years in normal industrial use. That's more than twice the output of an incandescent lamp of equivalent wattage.

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(Continued from page 10A)

Floodlighting

First — Mahlon Miller, Electrical Contractor, Phoenixville, Pa.
Second — Robert Moser, Moser Electric Co., Fort Worth, Texas.
Third — R. W. Jones, R. W. Jones Electrical Co., Inc., Sharon, Mass.

Miscellaneous

First — E. C. Harper, Jr., Sanford Electric Co., Sanford, Fla.
Second — T. J. Reilly, Frame Electric Co., Pittsburgh, Pa.
Third — F. R. Haubelt, Haubelt Electric Co., Pittsburgh, Pa.
Honorable Mentions — Thomas J. Reilly, Frame Electric Co., Pittsburgh, Pa.; Murray Ford, Burton Ford & Sons, Ltd., Hamilton, Ont.; R. B. Nuelle, Gibbs Bros. Electric Co., Los Angeles, Calif.

Spring Garden Institute Offers Advanced Lighting Course

As part of the Spring Garden Institute's adult education program in Philadelphia ,an advanced course in illumination design is being offered under the auspices of the Philadelphia Section of I.E.S. Coordinator of instruction is A. A. Brainerd, Philadelphia Electric Co.

Classes began January 13 and are being held, from 6:30 to 9:30 p.m., every Thursday night for the remainder of the winter term, at the Institute.

This advanced course follows a series of classes presented for the past two years in fundamentals of illuminating engineering.

invites you in '55

September 12-16, 1955

I.E.S. National Technical Conference

New ideas and developments in the field of illuminating engineering will be presented at the 1955 I.E.S. National Technical Conference. Time: September 12 through 16; place: the Statler Hotel, Cleveland, Ohio. Record attendance is anticipated.

In addition to the technical program being scheduled, the week of activities planned by the Conference Committee, Charlie Amick, Chairman, will provide education, fellowship and fun for both delegates and guests. More details about the technical papers to be presented, committee meetings, and entertainment will be given in forthcoming issues of ILLUMINATING ENGINEERING.

ABOUT PEOPLE

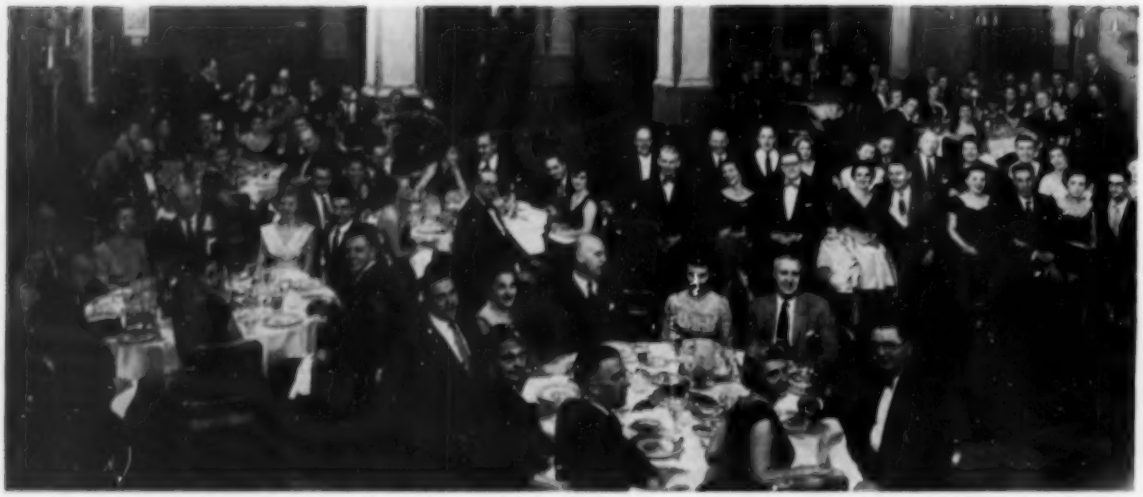
Complete reorganization of the Lamp Division of the General Electric Co. was announced by **Donald L. Millham**, G-E vice-president and general manager of the division. The reorganization involves decentralization of the division by the creation of six product or business departments, each headed by a general manager, and a complete business organization of itself, and an Advanced Lamp Development Laboratory. Two service departments, now in existence, complete the organization. The new product departments and their general managers are: Large Lamp Department, **Herman L. Weiss**; Miniature Lamp Department, **Kenneth G. Reider**; Photo Lamp Department, **William E. Davidson**; Lamp Glass Department, **Ernest A. Howard**; Lamp Wire and Phosphor Department, **Robert F. Johnson**; Lamp Leads and Bases Department, **Walter P. Cartun**. **Carl L. Olson** will be manager of the newly created laboratory, which will devote its efforts to basic research as distinguished from product development. The new laboratory will be concerned with "the creation, use, and effects of light, and the use and effect of new processes, new materials, and new manufacturing and engineering techniques in all the businesses constituting the division," Mr. Millham said. All product departments and the new laboratory will have their headquarters at Nela Park. Two of the existing service organizations have not been absorbed into the new operating departments. They are the Legal Department, with **Douglas S. Moore** as counsel, and the Lamp Equipment Operation, formerly the Cleveland Equipment Works, with **William R. Gerow** as manager.

Dr. Oliver T. Buckley, of Maplewood, N. J., retired president of Bell Telephone Laboratories, Inc., has been awarded the 1954 Edison Medal by the American Institute of Electrical Engineers. Dr. Buckley was cited "for his personal contributions to the science and art which have made possible a trans-Atlantic telephone cable; for his wise leadership of a great industrial laboratory; for outstanding services to the Government of his country." The Medal was presented February 2, during the Winter General Meeting of the Institute in New York City.

During the same AIEE meeting, the John Scott Medal was awarded to **Marvin Camras**, senior physicist, Armour Research Foundation, for "the invention of the method and means of obtaining distortion free magnetic recordings through high-frequency bias."

Matthew Westphal has been named works manager of the Trenton Plant of the Westinghouse Electric Corp., Lamp Division. Mr. Westphal, who has previously been superintendent of miniature and large lamp departments, will be responsible for the production of incandescent lamps for commercial, industrial and residential use. He is succeeded at the Bloomfield miniature and large lamp plant by **Albert W. Holzer**, who was formerly assistant superintendent of miniature lamp manufacture.

(Continued on page 14A)



ANNUAL dinner-dance of the New York Section, December 9, was attended by many members of the I.E.S. Council, who were in New York for their December meeting.

(Continued from page 13A)

At the annual meeting of the RLM Standards Institute, Inc., officers and trustees for the coming year were elected as follows: **Hoyt P. Steele**, Benjamin Electric Mfg. Co., President and Chairman of the Board of Trustees; **H. A. Barnes**, Wheeler Reflector Co., Vice-President and Trustee; **E. C. Huerkamp**, Westinghouse Electric Corp., Treasurer and Trustee; **Burton G. Tremaine, Jr.**, The Miller Co., Secretary; **W. P. Lowell, Jr.**, Sylvania Electric Products, Inc., Trustee; **D. E. Worrell**, Quadrangle Manufacturing Co., Trustee; **J. F. Whitehead, Jr.**, Day-Brite Lighting Inc., Trustee and Chairman of the Technical Committee; and **S. R. Nayamith**, Managing Director and Secretary.

David P. Wood, Manager of Sales Promotion for Commonwealth Edison Co., has been elected president of the Chicago Lighting Institute. He succeeds **G. K. Hardacre**, of Public Service Co., who served as president the last five years. **T. D. Scarff**, Manager of the Lamp Department of General Electric Co., Chicago office, was named Vice-President, succeeding **Hoyt P. Steele**, President of Benjamin Electric Mfg. Co. **M. J. Maiers** of Commonwealth Edison Co., was elected Secretary-Treasurer. **Carl W. Zersen** continues as Managing Director.

Henry H. Helmbright, for many years head of the Railroad Lighting Section of the Application Engineering Department of General Electric Co.'s Lamp Division, retired December 31. He had had 35 years of service with the company, playing an important part in the introduction of sealed beam type headlighting and fluorescent lighting to the railroads. During World War II, he worked on railroad blackout lighting.

Two Canadian engineers have been awarded the 1954 Julian C. Smith medal, one of the top honors presented by the Engineering Institute of Canada. The winners are **Richard Lankaster Hearn**, general manager and chief engineer of the Hydro-Electric Power Commission of Ontario, in Toronto, and **William George Swan**, prominent consulting engineer of Vancouver. The Julian C. Smith Medal is awarded "for achievement in the development of Canada."

John H. Max has been named manager of incandescent and fluorescent lamp sales for the lamp division of Westinghouse Electric Corp., for the complete line of commercial, industrial and residential incandescent and fluorescent lamps, including mercury-vapor and fluorescent mercury. Mr. Max was formerly manager of the Brooklyn-Long Island district, where he is succeeded by **E. F. Christman**, who was formerly a member of the eastern regional sales staff in New York City.

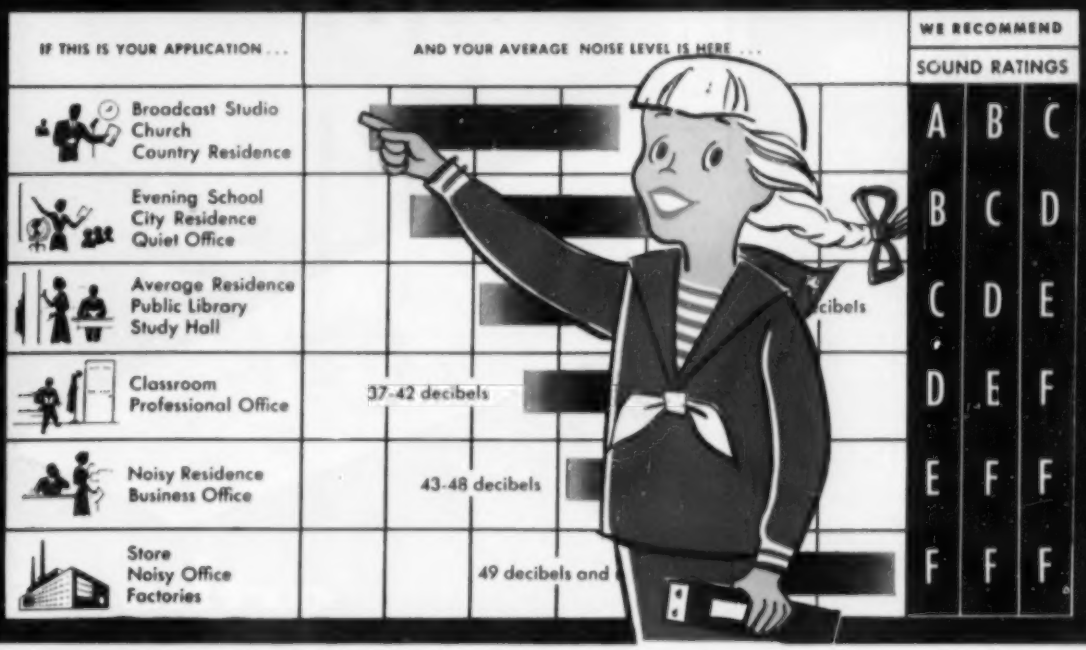
Leonard V. James has been retained by Solar Light Manufacturing Co., Chicago and Los Angeles, as a technical consultant. He will concentrate on lighting design and lighting application problems. Mr. James, who retired in 1949 after nearly 30 years with the General Electric Co., has since that time operated successfully as an independent illuminating engineering consultant.

Philip D. Parker, general sales manager of General Electric's Lamp Division for the past several years, and with the company for nearly 39 years, retired January 30 under provisions of the company's pension plan. Mr. Parker's first 14 years with General Electric were in the sale of miniature lamps, including automobile and flashlight types. In 1939 he had the sales responsibility for the introduction of the sealed beam lamp in the automotive field. During the past several years he has had the sales responsibility for all types of lamps sold through the Lamp Division's 35 districts. In World War I, Mr. Parker served in the Army Engineer Corps, and during the second World War, he worked closely with the War Production Board, particularly with respect to the Lamp Division's wartime production activities.

Joe L. Booker, formerly District Lamp and Lighting Specialist for General Electric Supply Co., Nashville, has joined Day-Brite Lighting, Inc., as Southern Sales Manager. Mr. Booker, a past-chairman of the Tennessee Valley Section of I.E.S., will have his offices at 1714 Hayes St., Nashville, Tenn.

Ralph M. Davis has been added to the Pittsburgh sales staff of the Pittsburgh Reflector Co., and will handle sales in this area for the entire line of incandescent and fluorescent equipment. Mr. Davis was formerly a manufacturer's representative and has held sales positions with Sylvania Electric Products and Westinghouse Electric Corp., Lamp Division.

(Continued on page 17A)



FLORA SHOWS YOU how easy it is to select a G-E ballast to meet your noise level requirements. For example: in a library installation where noise levels must be extremely low, or in a quiet office where ballast noise could interfere with work, G.E. has a ballast to do the job.

Flora* shows you why...

General Electric Sound-rated Ballasts Help You Save Lighting Dollars

Fluorescent lighting today is used in a countless variety of applications; from ultra-quiet broadcast studios and library reading rooms to noisy factories and offices. To help you select a lamp-ballast combination to meet the sound requirements of your installation, General Electric conducts extensive tests to measure the average sound level of each ballast model. This measurement is called "Sound Rating."

This exclusive G-E feature enables you to specify a model sound-rated to meet the needs of your fluorescent installation. You save valuable lighting dollars by reducing expensive noise complaints.

Next time you specify equipment for a fluorescent lighting installation, make sure you get the best . . . specify General Electric sound-rated ballasts. Look for the sound rating on the nameplate. A G-E ballast tag or sticker on your fixture is proof that it's equipped with the best in ballasts. It's the easy way to be certain. For further information on G-E ballasts, write Section 401-8, General Electric Company, Schenectady 5, New York.

*Miss Fluorescent Ballast, G.E.'s Ballast Mascot.
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G-E BALLASTS operate more quietly than average ballasts, and G-E engineers are constantly testing new materials and methods in order to better control ballast noise.

Five more reasons why

GENERAL ELECTRIC IS YOUR BEST BALLAST VALUE

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ortho-88
Trade Mark

Patent applied for

Write Today ... for brochure giving complete details of the remarkable new Ortho-88. In addition to installation and mounting data, it illustrates several examples of how Ortho-88 versatility can work for you. Catalog pages giving complete engineering data are included.

Gibson LIGHTING

Save up to 50% on installation costs: The Uni-Base (shown above) is part of your Ortho-88. It is a rigid, lightweight, open channel-way consisting a fixed power source (receptacle) for each fixture. Sections, 20-24 ft. long, are assembled and wired on the floor and hung as a unit. Fixtures, mounted without tools in unbroken close, fall into perfect alignment automatically. The whole operation is accomplished easier, faster and more economically with savings in time and materials up to 50%.

Save on materials: The amount of conduit required is reduced substantially. Suspension, chain suspension accessories, cord and plug, etc. are completely eliminated.

Unheard-of flexibility for you: Fixtures may be mounted on the Uni-Base continuous row, or spaced at intervals of 4', 8' or 12'. They can be moved about, or additions made, as conditions demand without further electrical work and without interrupting service. Repairs or replacements are made by changing fixtures without disturbing other fixtures on the circuit.

GIBSON Manufacturing Co.

1245 Piedmont Circle, N.E., Atlanta, Georgia

(*Continued from page* 14A)

Howard Tindall has been appointed manager of the Transformer Division of Federal Pacific Electric Co., Newark, N. J., with duties including the management of Gardner Electric Manufacturing Co., San Francisco, a wholly-owned subsidiary of Federal Pacific. Mr. Tindall was associated, from 1940 until his present assignment, with Moloney Electric Co., where he was a vice-president and assistant chief engineer.

Frederick H. Heintz has been appointed Midwest Regional Sales Manager of Lighting Products for Sylvania Electric Products Inc. Mr. Heintz, formerly sales manager of the company's Chicago district, will make his office at 2001 North Cornell Ave., Melrose Park, Ill. Another Midwest Region announcement by Sylvania is the appointment of **Samuel H. Eaton** as Special Sales Representative, assigned to the Lighting Division, National Accounts group.

Arthur S. Tylor has taken charge of lighting sales for Corning Glass Works in the Pacific Northwest, with his headquarters in the company office in the Merchandise Mart, San Francisco.

The appointment of **John E. Lee** as sales representative for the New England area of Jefferson Electric Co., Bellwood, Ill., has been announced. Mr. Lee, whose headquarters will be in New Haven, Conn., has been with Jefferson since May, 1953. Previously he was merchandising manager of the Polyken Products Division of Kendall Mills, Chicago.

Paul J. Puckett has been named manager of the Chesapeake lamp sales district of Westinghouse Electric Corp., and will direct lamp sales in a territory including greater Baltimore, all of Maryland, and parts of West Virginia and Virginia. Mr. Puckett was previously in the Roanoke sales office.

The appointment of **Hugh Vestal** as an assistant in sales and merchandising of the Markel Fresh-Air Maker Fans and Yard Lights has been announced by Markel Electric Products, Inc., Buffalo. Previous to this appointment, Mr. Vestal was a manufacturer's representative in the Southwest.

The appointment of **Edward M. Palmquist** as program director for education in the sciences has been announced by the National Science Foundation. Dr. Palmquist will be on leave of absence from the University of Missouri, where he is chairman of the Department of Botany. The program of education in the sciences is part of the Foundation's over-all program relating to scientific personnel and education, with the objective of encouraging more qualified young people to seek an education and careers in science and improving the education of those so encouraged.

Death

The Chicago Section reports with sorrow the passing of W. A. Seeberg (Curtis Lighting, Inc.).

BOOKS AND PAMPHLETS

*Books whose reviews are marked * are available for inspection at the Headquarters Office, Technical Dept.*

***Lighting for Color and Form** by Rollo Gillespie Williams, published 1954 by Pitman Publishing Co., New York; 356 6x9-inch pages, 138 illustrations; $8.50.

This book contains much practical information on color in lighting and colored lighting. It is written in a simple, direct style, with the concepts well explained and pointed up with detailed specific examples.

The first part of the volume, entitled "Light, Color Perception and Rendition," gives the theoretical and practical background necessary for an understanding of the application phenomena treated later. The five chapters in this section treat the basic sciences of Vision and Color, Illumination Control and Computation, Additive Color Blending, Color Temperature and Specification, and Color Quality in Fluorescent White Lighting (a summary of interest to those using fluorescent lamps in any interior).

The second section includes Light Sources and Filters (a helpful summary for those practicing illuminating engineers who are not color experts); Lighting Equipment for Color, Accent and Modeling (primarily for theatrical and/or display lighting); and Dimmers and Color Controls, including most standard British and American equipment for display and theatrical use, as well as the author's own color control equipment.

The section headed "Psychological and Aesthetic Factors" includes chapters on Directional Light, Shade, and Color (painting with light and colored light compositions); Color Harmony, Contrast and Discord; and Psychological Aspects of Color in Lighting, including mobile color changing dimmers, etc. "Lighting Application Techniques" gives much practical information on Display Lighting (theatrical tricks, how various fabric finishes and colors react to various qualities of lighting, the effect of background, mobile color lighting theory and equipment and control apparatus); Architectural Lighting (both black and white and color); Photographic, Motion Picture and Television Studio Lighting (brief); Stage Lighting (on which the author published a complete volume, *The Technique of Stage Lighting*, Pitman Publishing Co., 1947, revised 1952); Signs and Exterior Lighting including floodlighting for buildings, fountains, waterfalls and pools; Special Lighting Effects for signs, colored fountains, building floodlighting, theaters and show windows; and, very briefly, Color in Lighting for Photochemical Reproduction Processes.

Since the author has had considerable experience in his primary fields of stage and display lighting and colored lighting effects both in Great Britain and the United States, he has directed this book to English-speaking readers on both sides of the Atlantic by including detailed information on American and British light sources and control equipment. This volume will prove interesting reading to everyone concerned with any aspect of light and color, and will be an excellent practical handbook of "how to" data on colored lighting effects for every lighting engineer's library. There is some repetition of information throughout the book, because everything related to one subject is presented at one spot, eliminating references to other section. The volume appears to be well indexed.

U. S. Government Research Reports (formerly "Bibliography of Technical Reports") describes each month about 350 reports of research and development sponsored by the Government. This research generates a large amount of non-confidential technical information that is available to businessmen and researchers interested in developing new production processes, in making technological improvements and in avoiding duplication of research efforts. The research covers nearly every field of industrial activity, including chemicals, plastics, paints, electrical machinery and electronics, foods, fuels, lubricants, instrumentation, leather, lumber, metals, minerals, paper, ordnance, physics, rubber, textiles, aeronautics, transportation, water supply, and other items. The monthly listing of available reports can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., or any U. S. Department of Commerce Field Office, at $6.00 a year.

(*New Member listing begins on page* 36A)

it's GARCY by unanimous agreement

GARCY VISUALIER
Two-lamp and four-lamp units in 4 ft. and 8 ft. lengths for standard, rapid start or slimline lamps.

Take all the people who normally have a voice in the selection of lighting fixtures. Seat 'em around a conference table, and you can quickly get them to agree on Garcy.

The reason is that Garcy, by design, looks out for everyone's interest. Architects and designers like Garcy's clean styling and impressive appearance. Lighting engineers approve the high efficiency and low surface brightness which is combined, in the Visualier pictured above, with 45° x 45° shielding.

The exclusive one-piece shielding body is a favored feature with everyone. The complete louver, together with side panels, is formed as a single metal stamping . . . for great inherent strength, no rusting of welded parts, no loosening due to vibration.

For the electrical contractor, the one-piece shielding body is a real boon. With fewer parts to unwrap, carry up ladders and assemble, it saves many installation man-hours and dollars. Maintenance people are equally enthusiastic about the one-piece shielding body. Since it embodies 80% of the fixture's reflective surfaces, cleaning is fast and thorough. The shielding body may be cleaned by merely immersing it in a drum of detergent, leaving only the surface of the chassis to be cleaned by hand.

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Aluminum Co. of America
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384 Pape Ave., Toronto, Ont., Canada *W. A. Dalrymple*

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Minneapolis 16, Minn. *Cecil H. Branham*

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Toledo 14, Ohio. *Dr. M. H. Bigelow*

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Des Plaines, Ill. *Benjamin S. Benson*

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570 Dunsmuir St., Vancouver, B. C., Canada *H. N. Walters*

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36 Main St., Brockton 67, Mass. *W. A. Forbush*

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P.O. Box 512, Riverside, Calif. *Robert W. Dowd*

Calpa Products Co.
5420-28 Paschall Ave., Philadelphia 4, Pa. *Paul C. Calisi*

Cambridge Electric Light Co.
Cambridge 39, Mass. *James L. Corrigan*

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212 King St., Toronto, Ont. *R. M. Love*

Canadian General Electric Co., Ltd.
Lamp Division
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Canadian Laco Lamps Ltd.
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Canadian Line Materials, Ltd.
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City of Riverside Light Dept.
P.O. Box 826, Riverside, Calif. *A. J. Kennedy*

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City of Tacoma
Dept. of Pub. Util., Light Div.
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Consumers Public Power District
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(*Note:* Names of Official Representatives appear in italics.)

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H. L. Logan

Holophane Company, Limited
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Canada. *Frank T. Groome*

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Jack R. Stone

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I. M. Fixman

Hubbard and Company
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Illinois Power Co.
134 East Main St. (L. Box 511B),
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2547 E. Nine Mile Road, Hazel Park, Mich.
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Iowa Electric Light & Power Co.
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Iowa-Illinois Gas & Electric Co.
United Light Bldg., Davenport, Iowa
John M. Hollingsworth

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312 Sixth Ave., Des Moines 3, Iowa
N. Bernard Gussett

Iowa Public Service Co., East Div.
400 Commercial St., Waterloo, Iowa
C. R. Wagoner

Iowa Public Service Co., Sioux City Division
P.O. Box 778, Sioux City 4, Iowa *C. R. Tracy*

Jefferson Electric Co.
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Joslyn Mfg. & Supply Co.
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John M. Arthur, Jr.

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Keystone Electric Manufacturing Co.
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Ivan Kirlin

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Highland Park, Ill. *Joseph A. Schneller*

Lightolier Co.
11 East 36th St., New York 16, N. Y. *H. Stollnitz*

(Continued on page 22A)

Treasury Department

Typical Private Office

Easy on the Eyes

...with Lighting by LITECONTROL

Where illumination's concerned sales-minded electric utilities want the best. This one in Kentucky uses two types of standard LITECONTROL fixtures for efficient control of light . . . and smart appearance. Rolled-edge trim helps *hide* uneven spots in ceilings that flat trims only emphasize.

In the executive office, LITECONTROL No. 5134 with Holophane No. 9016 low brightness lens provides ample illumination—free from glare and sharp contrasts.

Easy to maintain. Lenses help keep dirt out. To clean—simply *push trigger-catch*, open door, wipe surfaces with damp rag, and *push door shut*—no tools required.

At left, LITECONTROL fixture No. 5838 is a practical selection for the general office. Rugged, all-metal design provides 35 to 25 degree cutoff from egg-crate louvers . . . holds glare down at critical viewing angles. No tools needed for servicing.

Two more examples of the "More Light and Looks for Your Money" you get with *every* LITECONTROL Fixture.

INSTALLATION: Kentucky Utilities Company, Lexington, Kentucky.
ARCHITECT: Robert W. McMeekin, Lexington, Kentucky.
LIGHTING ENGINEERS: R. W. Wilson, J. T. Cole & K. R. Carday, Kentucky Utilities Company.
DISTRIBUTOR: Graybar Electric Company, Inc., Indianapolis, Indiana.
ELECTRICAL CONTRACTOR: Hatfield Electric Company, Indianapolis, Indiana.

Treasury Department

FIXTURES: 18 No. 5838, 3-lamp recessed louvered fixtures on 9' centers—standard cool white 96T12 lamps.
INTENSITY: Room average, 90 footcandles. Desk Tops 75-80 footcandles.

Typical Private Office

FIXTURES: 8 No. 5134, 3-lamp recessed fixtures with No. 9016 lenses on 8' centers—standard warm white 48T12 lamps.
INTENSITY: Room average, 70 footcandles. Desk Tops, 85 footcandles.

Note: Intensity figures by Kentucky Utility engineers after three months operation.

LITECONTROL
Fixtures
LITECONTROL CORPORATION
36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

(Continued from page 20A)

Line Material Co., Division of McGraw Electric Co.
600 North 8th St., Milwaukee 1, Wis. *M. C. Harsh*

Litecontrol Corp.
36 Pleasant St.
Watertown 72, Mass. *Lawrence E. Brown*

Litecraft Manufacturing Corp.
8 East 36th St., New York 16, N. Y. *Ben Roisman*

Lithonia Lighting Products Co., Inc.
Lithonia, Ga. *Robert J. Freeman*

Louisiana Power & Light Co.
142 Delaronde St., Station "A,"
New Orleans, La. *C. L. Osterberger*

Luminator, Inc.
120 N. Peoria St., Chicago 7, Ill.
Albert L. Arenberg

Luminous Ceilings Inc.
2500 West North Ave., Chicago 47, Ill.
Louis Rosenstein

Luxor Lighting Products Inc.
Empire State Building
New York, N. Y. *Sergei Markotan*

Lynn Gas & Electric Co.
90 Exchange St., Lynn, Mass. *James A. Cook*

Macbeth Corp.
P.O. Box 950, Newburgh, N. Y. *Norman Macbeth*

Main Electric Company
741 Milwaukee Ave., Chicago, Ill.
William Kamin

Major Equipment Company Inc.
4609-19 Fullerton Ave.,Chicago, Ill.
Ross O Major

Markel Electric Products, Inc.
145 E. Seneca St., Buffalo 3, N. Y.
Morris L. Markel

Markstone Manufacturing Co.
2460 W. George St., Chicago, Ill. *Martin Schwartz*

Marlow Lights, Inc.
60 South Ave., Fanwood, N. J. *Frank Martin*

Marvin Manufacturing Co.
648 Santa Fe
Los Angeles, Calif. *Carl O. Anderson*

La Cie Martineau Electrique Ltee.
24 rue du Roi, Quebec, Que. *Henri Martineau*

Meade Electric Company, Inc.
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Chicago 44, Ill. *Henry E. Burkhardt*

Metalcraft Products Co., Inc.
Mascher & Lippincott Sts.
Philadelphia 33, Pa. *Nathan Bloom*

Metropolitan Edison Co.
412 Washington St., Reading, Pa.
T. O. McQuiston

Metropolitan Electrical Supply Co.
20 N. Jefferson St., Chicago 6, Ill. *Fred Pedrigi*

Midwest Chandelier Co.
15th & Gentry Sts., No. Kansas City 16, Mo.
Sidney Lefkovitz

The Miller Co.
Meriden, Conn. *G. W. Beals*

Mississippi Glass Co.
88 Angelica St.
St. Louis 7, Mo. *C. J. Youngblood*

Mississippi Power Co.
Gulfport, Miss. *R. M. Shearer*

Mississippi Power & Light Co.
Lampton Building, Jackson, Miss. *B. M. Davis*

Mitchell Manufacturing Company
2525 Clybourn Ave., Chicago 14, Ill.
Bernard Mitchell

Mitchell Manufacturing Co., Ltd.
19 Waterman Ave., Toronto 13, Ont.
J. E. Landers

Modern Light Company
7809 Industrial Court
Maplewood 17, Mo. *Edwin L. Ehret*

Modern Light & Equipment Co.
5812 S. Wabash Ave., Chicago, Ill.
M. L. Offenberg

Moe Light, Inc.
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Monroe Electric Co.
157 W. Ontario St., Chicago 10, Ill. *Albert Kahn*

Montana-Dakota Utilities Co.
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W. L. Hayes

The Montana Power Co.
40 East Broadway, Butte, Mont. *D. J. McGonigle*

Morlite Equipment Co.
P. O. Box 106, Girard, Pa. *Finley J. Gordon*

Multi Electric Mfg. Co.
4225-45 West Lake St.
Chicago, Ill. *Leo J. McDonald*

Municipal Light and Power Dept.
City of Pasadena, California, 302 City Hall
Pasadena 1, Calif. *T. M. Goodrich*

Mutual Sunset Lamp Mfg. Co., Inc.
540 Empire State Bldg., New York 1, N. Y.
Morris Thau

The Narragansett Electric Co.
49 Westminster St., Providence 1, R. I.
C. R. Broadhead

National Chemical & Manufacturing Co.
Luminall Paint Div.
3617 So. May St., Chicago 9, Ill.
John Marshall Zw

Nepo Mfg. Co.
6025 N. Keystone Ave.
Chicago 30, Ill. *N. E. Passman*

New Bedford Gas & Edison Light Co.
695 Purchase St., New Bedford, Mass.
W. S. Fenstermacher

New Orleans Public Service, Inc.
317 Baronne St., New Orleans, La. *S. L. Drumm*

New York State Electric & Gas Corp.
62 Henry St., Binghamton, N. Y.
Earle C. Edwards

Niagara Mohawk Power Corp.
300 Erie Blvd. W., Syracuse 2, N. Y.
R. H. Stratton

Northern Electric Co., Ltd.
1600 Notre Dame St., West, Montreal, Quebec
A. G. V. Smith

Northern Indiana Public Service Co.
5265 Hohman Ave., Hammond, Ind.
J. C. Sackman

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1657 No. Water St., Milwaukee 2, Wis.
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The Ohio Public Service Co.
P.O. Box 6058, Cleveland 1, Ohio *C. L. Dunn*

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Box 1498, Oklahoma City 1, Okla. *E. W. Gray*

Omaha Public Power District
720 Electric Bldg., Omaha 2, Neb. *E. E. Schwalm*

Pacific Gas & Electric Co.
245 Market St., San Francisco 6, Calif.
O. R. Doerr

Pacific Power & Light Co.
509 N.W. 10th St.
Portland 9, Ore. *F. M. Reis*

Peerless Electric Limited
5585 Fullum, Montreal 36, Que. *L. A. Van Duzer*

Pennsylvania Electric Co.
535 Vine St., Johnstown, Pa. *Howard E. Ross*

Pennsylvania Power Co.
19 E. Washington St., New Castle, Pa.
P. G. Dingledy

Pennsylvania Power & Light Co.
901 Hamilton St., Allentown, Pa. *J. M. Stedman*

The Perfecilte Company
1457 E. 40th St., Cleveland, Ohio
Joseph L. Jaffe, Jr.

Philadelphia Electric Co.
1000 Chestnut St., Philadelphia 5, Pa.
R. G. Rincliffe

Philadelphia Electrical & Mfg. Co.
1228-56 N. 31st St., Philadelphia 21, Pa.
R. A. Manwaring

Phoenix Glass Co.
Monaca, Pa. *D. G. Cameron*

Pierce Electric Co.
567 W. Adams St., Chicago 6, Ill. *John H. Pierce*

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Pittsburgh 22, Pa. *J. R. Nicholson*

Pittsburgh Plate Glass Co.
Grant Bldg., Pittsburgh 19, Pa. *R. B. Tucker*

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C. D. Lyon

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Toronto 9, Ont. *M. B. Hastings*

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E. George Goddard

Pryne & Co., Inc.
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Public Service Co. of Colorado
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Public Service Co. of Indiana, Inc.
1000 E. Main, Plainfield, Ind. *Robert McMurray*

Public Service Co. of Oklahoma
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Public Service Electric & Gas Co.
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Quaker City Electric Mfg. Co.
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Reuben Haberman

Quebec Hydro-Electric Commission
107 Craig St., West, Montreal, Que.
Paul E. Poitras

Quebec Power Company
P. O. Box 1607, Quebec, Que. *Jean Saint-Jaques*

Rambusch Decorating Co.
40 W. 13th St., New York 19, N. Y.
Edward Rambusch

Revere Electric Mfg. Co.
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Murray J. Whitfield

Revere Electric Supply Company
2501 W. Washington Blvd., Chicago 12, Ill.
Arthur Peterson

Rochester Gas & Electric Corp.
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Rockland Light & Power Co.
Nyack, N. Y. *D. S. Schaab*

Rohm and Haas Co.
222 W. Washington Sq.
Philadelphia 5, Pa. *H. A. Williams*

(Continued on page 24A)

Photograph by Consolidated Edison

You get Permanence, Quality, Beauty with PLEXIGLAS

This luminous-area lighting at the County Trust Company, Mt. Vernon, N.Y., illustrates the important advantages obtained with PLEXIGLAS acrylic plastic diffusers.

Permanence. Rigid, strong and durable, PLEXIGLAS is noted for freedom from discoloration, and resistance to breakage. It has a firm, solid appearance in harmony with other room surfaces.

Quality Illumination. PLEXIGLAS provides maximum transmission of light and complete, edge-to-edge diffusion that accents the quality of architectural design.

Beauty. Lighted or unlighted, PLEXIGLAS is pleasing to the eye—the most beautiful of all types of plastics.

For the *best* in illumination, specify PLEXIGLAS diffusers for luminous ceiling areas and large-area lighting equipment for indoor or outdoor use. We will be glad to send you detailed information on this multipurpose lighting material.

PLEXIGLAS *is a trade-mark, Reg. U.S. Pat. Off. and in other principal countries in the Western Hemisphere.*

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(Continued from page 22A)

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Ruby-Philite Corp.
52-02 Queens Blvd., Long Island City 1, N. Y.
Louis Phillips

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Savannah Electric & Power Co.
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William Shalda

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L. A. Hobbs

Sola Electric Co.
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George R. Atchison

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Jerome Gimbel

Super Electric Construction Co.
4500 W. Chicago Ave., Chicago 51, Ill.
P. M. Pavesich

Supreme Lighting Company
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Montreal, Que., Canada. *John J. Kavanagh*

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Cass & Tampa Sts., Tampa 1, Fla. *W. C MacInnes*

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Thompson Electric Co.
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Toledo Edison Co.
Edison Bldg., Toledo 4, Ohio *Charles A. Harrison*

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Wasco Flashing Co.
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Gordon F. DeFoe

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W. C. Stockberger

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*® HOLOPHANE CO., INC.

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Leading organizations in every field of endeavor are specifying Ruby-Philite today to gain maximum efficiency from their lighting installations. They have found that Ruby-Philite luminaires provide desired levels of illumination with a minimum of distracting glare or brightness . . . often at substantial savings realized thru higher luminaire efficiency and lower installation costs. You, too, will find it easier to make your buildings come alive with proper lighting when you specify Ruby-Philite. Write now for complete catalog data.

*SERIES 25 TROFFERS • Available in 8 different shieldings for recess installation in any type of ceiling.

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MEMBER N.E.M.A.

Ruby-Philite Corp.

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Fluorescent Lighting

Costs Less When You Use

FLEUR·O·LIER FIXTURES

You can buy fluorescent lighting 2 ways: 1. Initial Low Cost — or 2. Long-Term Economy.

Fixtures that carry the Fleur-O-Lier label usually aren't found in the Initial Low Cost group. But the quality built into every Fleur-O-Lier fixture assures you of maximum Long Term Economy.

You'll get better, more satisfactory, and more economical fluorescent lighting with Fleur-O-Lier luminaires because:

1. Mechanical and electrical construction meet rigid specifications.
2. Only Certified CBM Ballasts are used.
3. Only Certified Starters are used.
4. Complete photometric test data, including distribution curves and coefficients of utilization are provided to tell you *in advance* the lighting results you'll get.
5. Electrical Testing Laboratories, Inc., test, check and certify that fixtures conform to all the above before they can carry the Fleur-O-Lier label.

For assured fluorescent satisfaction and economy . . .

Make Certain Your Fixtures are FLEUR-O-LIER

FLEUR·O·LIER

Manufacturers

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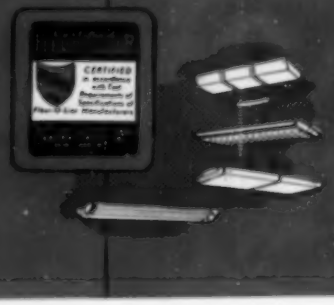
Fleur-O-Lier is not the name of an individual manufacturer, but of a group of fixtures made by leading manufacturers. Participation in the Fleur-O-Lier program is open to any manufacturer who complies with Fleur-O-Lier requirements.



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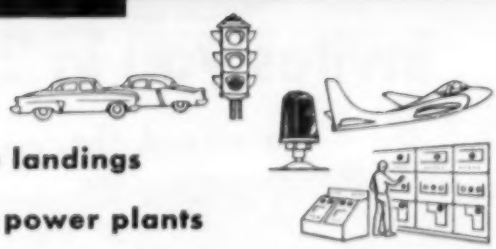

——————say "go" to traffic

——————guide aircraft to safe landings

——————signal "all's well" in power plants

Vital services are performed by Kopp lenses and other glass products. Many of these applications call for accurate control of a beam of light—which may be concentrated, spread or diffused. Uniform transmission of colors may be required; resistance to heat and thermal shock are often needed.

Kopp specializes in the production of glass parts requiring skillful engineering design and careful, accurate workmanship. We will be glad to submit ideas, designs and prices for your consideration.

WRITE FOR
the new brochure describing the design and manufacture of Kopp Glass Products.

KOPP GLASS

KOPP GLASS, Inc.

SWISSVALE, PA.

**Building—*Through Business*
—for a Better America!**

support Junior Achievement

This Day-Brite installation of Mobilex fixtures is only one of the Dwyer's Shopping Center units — a Milwaukee shopping center recently completed. Note Derby downlight installation in sidewalk canopy.

INVITATION TO CUSTOMERS

"COME IN AND SEE"

Whether people *go by* or *come buy* often depends on light. That's why store lighting is so vital to sales — when properly planned, it can be an engraved invitation that turns *passers* into *buyers*.

Store lighting for sales is Day-Brite's business! Here, a corps of store-lighting specialists is at your disposal—qualified to recommend not only the type of fixture suited to your selling requirements but also the most advantageous and economical fixture placement.

Day-Brite store-lighting engineers can give you the right answers. Whether it's a Day-Brite "Mobilex" installation like the one pictured — whether long runs can stimulate merchandise movement — whether supplementary or "accent" lighting is indicated — you can always rely on Day-Brite recommendations.

So, whenever you think of increased sales, call on Day-Brite store-lighting specialists. They are fully abreast of current advances in lighting for sales.

CALL IN A DAY-BRITE STORE-LIGHTING EXPERT! ...SEE! EXAMINE! COMPARE! You'll choose Day-Brite fixtures because their superiorities are self-evident.

Day-Brite Lighting, Inc., 5432 Bulwer Ave., St. Louis 7, Missouri.
In Canada: Amalgamated Electric Corp., Ltd., Toronto 5, Ontario.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

5414

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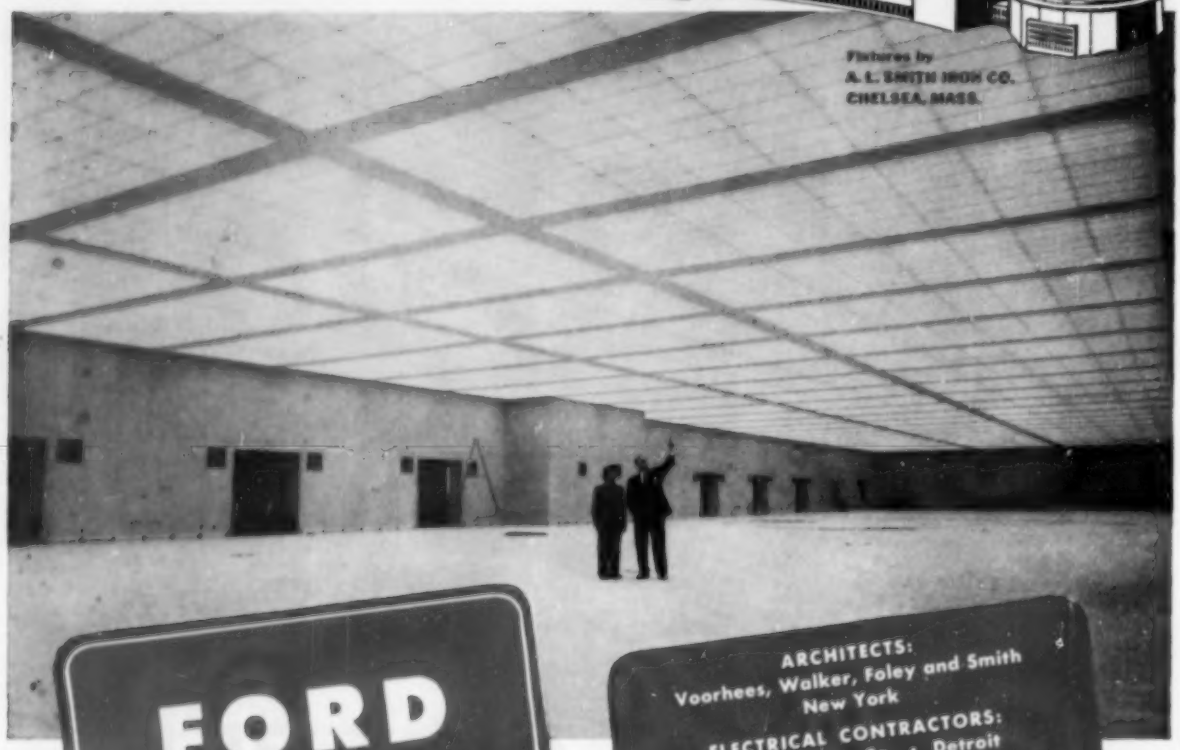

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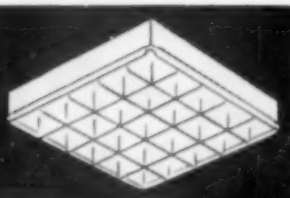

can do the job so well . . .

When it comes to Low brightness, large area light sources . . .

Another striking example of how LUVE-TILE provides the utmost in illuminated ceilings is shown in these photos of the Industrial National Bank of Detroit, Michigan.

LUVE-TILE is easy to maintain—dirt collection is much less rapid than with other types. . . and it will not hold insects and other small matter. Because LUVE-TILE is hinged, servicing of fixtures is easy. LUVE-TILE is also rigid to handle, light in weight and easy to remove and wash.

LUVE-TILE may be assembled to suit any room and custom-made work is never necessary. No unsightly horizontal bars or rosettes are used for support. Since LUVE-TILE comes in 4 shades unlimited colour combinations are possible.

Sprinklers and air ducts are concealed and wiring and other work may be simply surface mounted. Also low cost acoustic material may be sprayed on the cavity above the tile for sound proofing. LUVE-TILE is practical and economical to use in any area, right down to a few square feet. It is also widely used in display for special effects.

These Firms Were Concerned with the Industrial National Bank Building

Architect and Engineer	Louis G. Redstone 10811 Puritan, Detroit
Contractor	Turner Engineering Company 470 Brainard, Detroit
Wholesaler	Michigan Chandelier, Company

Write for free LUVE-TILE Catalogues sections Nos. 8 and 8A.

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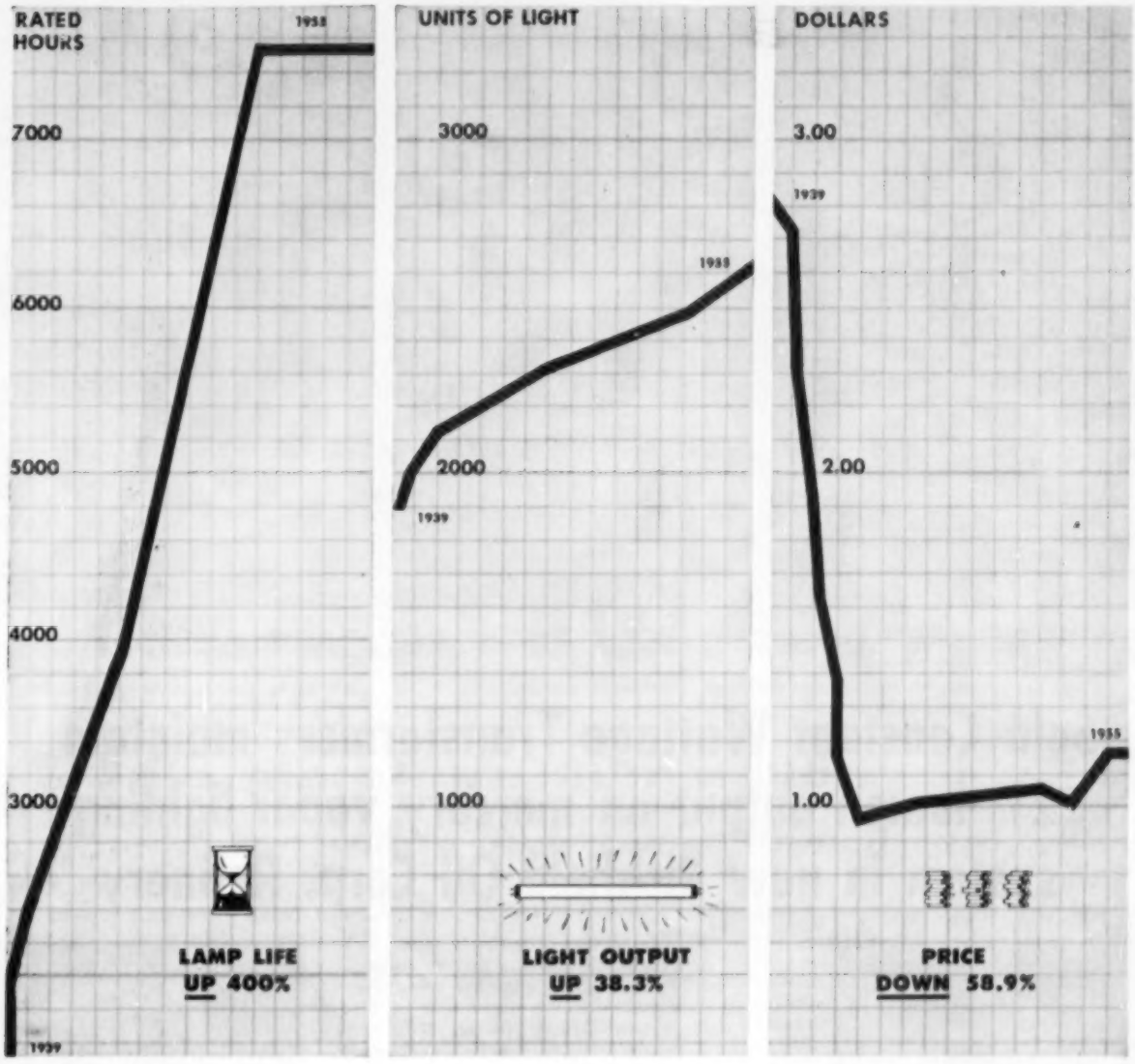


16 times more value for your fluorescent lamp dollar than in 1939

Today you don't have to pay more than $1.15 for the finest fluorescent lamp made: General Electric. Sixteen years ago it would have cost you $2.80 or $1.65 more. And while price has been going down, we've been pushing quality up. General Electric has upped light output 38%, increased lamp life 400%.

In terms of what you really judge lamps by, a General Electric 40-watt fluorescent lamp that lists at $1.15 today is a *16-times bigger value than it was in 1939.*

For further information, contact your G-E lamp supplier or write to Lamp Division, General Electric, Department 166-IE-2, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

INTERIOR INSTALLATION CLOSEUP: Here's an unretouched photograph, taken at night, of the actual mercury vapor lighting installation at Richfield Oil Corporation's new refinery. The Sola Constant Wattage Transformers (see inset for transformer detail) are mounted against the ceiling and have been painted white.

Sola Constant Wattage Transformers maintain ±2% lumen output on mercury vapor lighting system in new Richfield Oil Corp. Refinery

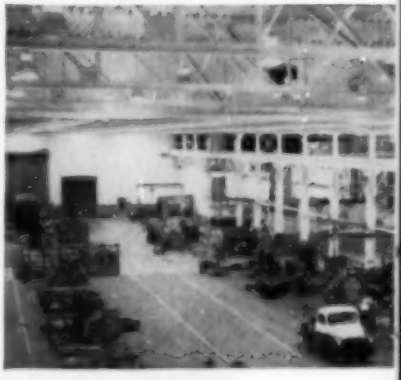
The mercury vapor lighting system — like much of the other equipment installed at Richfield Oil Corporation's new California Refinery — is making news. It's newsworthy because it has set a new standard of excellence for interior, high bay, mercury vapor lighting.

The heart of the Richfield refinery's entire mercury vapor lighting system is the regulated energy supplied to the lamps by Sola Constant Wattage Transformers. Regulated operation of mercury vapor lamps results in the following eight advantages:

1. *Constant light output within ±2% regardless of line voltage variations as great as 25%.*
2. *Lamps stay lit, even when line voltage drops as much as 40v (on 110v line).*
3. *Positive starting.*
4. *Elimination of primary taps.*
5. *Negligible starting current surge.*
6. *Protection on both open and short circuit.*
7. *Extended lamp life.*
8. *More ballasts can be installed on each circuit.*

Outdoor weather-proof Sola Constant Wattage Transformers for mercury vapor lamps are also available. They have the identical advantages of the indoor type. They are particularly suitable for such industrial and commercial lighting applications as gasoline stations, plant protection, store fronts and parking lots.

These mercury vapor ballasts adapt the patented Sola Constant Voltage Principle widely used in Sola regulating transformers for electrical and electronic applications.



TYPICAL ILLUMINATION QUALITY: Constant wattage mercury lighting for shop maintenance area of refinery

Write for Bulletin 3B—MV-211 for data

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Chicago's Grant Park Underground Garage uses Corning flat and bent Alba-Lite lightingware. Alba-Lite comes in a variety of bends to provide design flexibility. Flat Alba-Lite panels are available in three patterns offering true light source transmission, exceptional brightness control by diffusion, high fixture efficiency, permanence and low upkeep cost.

Owner—Chicago Park District
Consulting Engineers—Ralph H. Burke, Inc., Chicago, Ill.
General Contractor—Electrical work installed by White City Electric Company and J. Livingston and Co., under John Griffith & Son Construction Co., all of Chicago, Ill.
Fixture Manufacturer—Solar Light Manufacturing Company, Chicago, Ill.

Safe, glare-free illumination

for world's largest underground garage

No more circling weary blocks looking for a place to park in Chicago's busy Grant Park area.

Now you swing your car off the street down a ramp to the new Grant Park Underground Garage. There's space there for 2359 cars in 787,000 square feet of floor space.

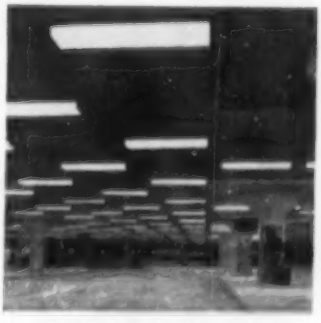
Lighting in this garage, wherein 90% of the cars are self-parkers, must provide for quick adjustment from natural to artificial illumination. "Avenues" must be bright—but free of accident-causing glare and shadows. Walkways must be safe for pedestrians on their way to and from their cars.

High efficiency

Corning Alba-Lite lightingware was selected because it meets all of the requirements for safe lighting established by the Chicago Park District. Alba-Lite is a translucent opal glass. It transmits 60-65% of the light and diffusely reflects 25-30% for an efficiency of greater than 90%. And Alba-Lite transmits the true color of the light source.

In this area where discoloration of lightingware by exhaust fumes could be an expensive maintenance item, easy-to-clean Alba-Lite again proves a wise choice. Nor will time ever dim Alba-Lite's sparkling appearance.

For additional information about Alba-Lite and other Corning-engineered lightingware—louvering, diffusing, and prismatic—use the form below.



Connected lighting load, approximately 450 KW. Maintained lighting level, main thoroughfares, 22 foot-candles. Maintained lighting levels, distribution center, 30 foot-candles. Average parking area illumination, 10 foot-candles.

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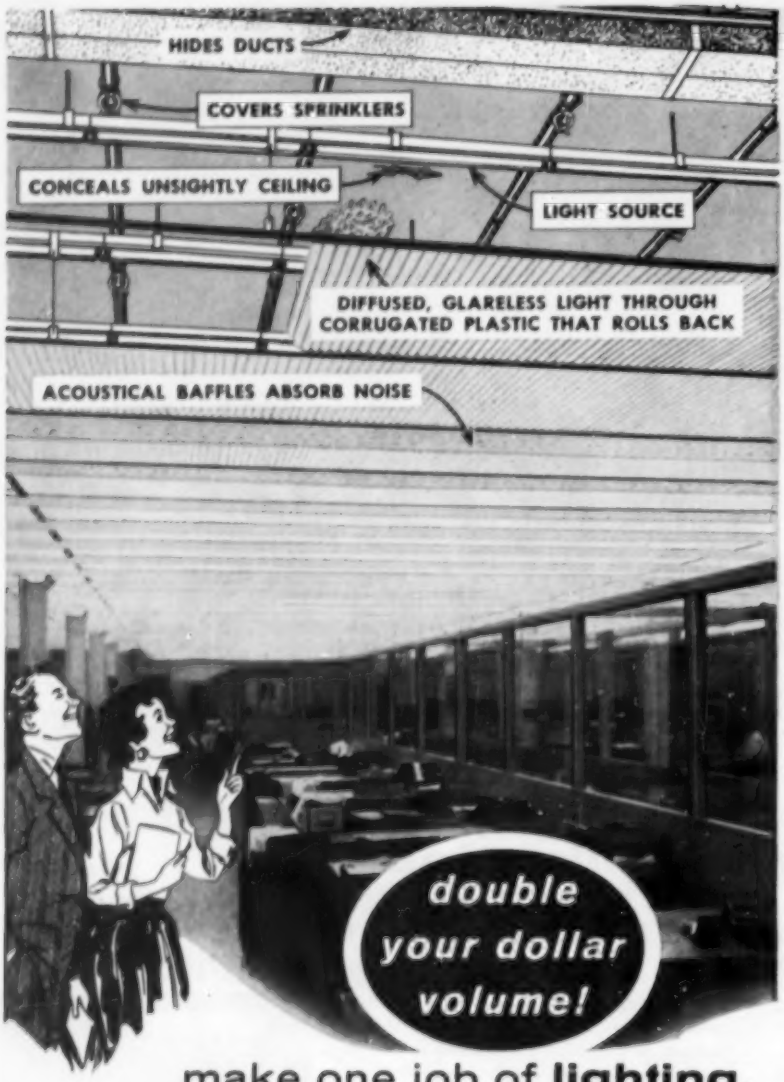

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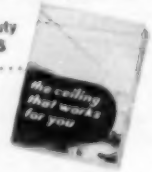

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Flood, J. G., Electrical Distributing c., Phoenix, Ariz.

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Moore, V. J., Niagara Mohawk Power Corp., Syracuse, N. Y.

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Cowan, J. L., Day-Brite Lighting, Inc., Chicago, Ill.
Kennedy, E. A., Kennedy Webster, Chicago, Ill.
Martin, Frank, Garden City Plating & Mfg. Co., Chicago, Ill.
Tantillo, A. V., Garden City Plating & Mfg. Co., Chicago, Ill.
Walton, R. E., Sweney Electric Co. Inc., Gary, Ind.
West, D. E., General Electric Company, Chicago, Ill.
West, R. F., Sylvania Electric Products Inc., Melrose Park, Ill.
Wright, J. A., Curtis Lighting Inc., Chicago, Ill.

Student Members:
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Stuker, David, University of Illinois, Urbana, Ill.

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Saccany, R. C., Line Material Co., Cleveland, Ohio.

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Green, W. W., Connecticut Light & Power Co., Waterbury, Conn.

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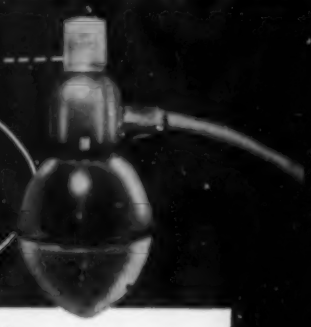

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New 1955

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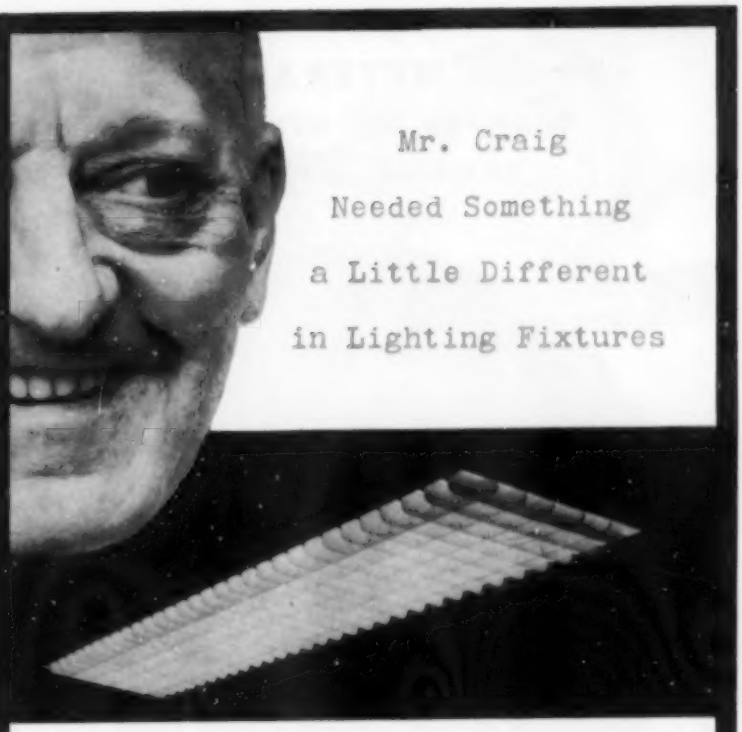

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CHAMPION Lamps

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February 1955

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- Pioneers in Fluorescence since its inception.
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In Canada: Mitchell Mfg. Co., Ltd., 19 Waterman Ave., Toronto

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A welcomed sound to store owners across the country is that of hearing their cash registers ringing up more and more sales after installing Sunbeam lighting. This increase in the store's business is the net result of using proper levels of quality illumination with fixtures engineered to put emphasis on the sales appeal of the merchandise. Among the very many types of Sunbeam Visionaires® designed for advanced store lighting, the shallow #L1780 series has proved to be exceedingly popular and successful. These efficient units are easily adaptable to various geometric patterns to suit the architectural needs. Specify Sunbeam on your store lighting layouts.

SUNBEAM visionaire

New Perspective on Industrial Lighting

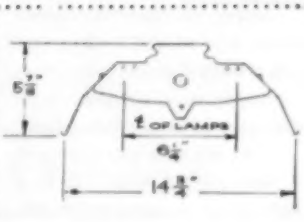
New Electro Silv-A-King

Electro Silv-A-King now brings you this 26% RLM approved Uplight fixture, with these outstanding features . . .

- Cast Aluminum Ends
- Continuous Run Mounting Without Costly and Time-Consuming Couplers
- All Units May Be Used for Individual or Continuous Mounting
- Reflector Locking Method for Low Cost Installation
- 89% Efficiency—With 32% Side Shielding
- Available with Louvers for Longitudinal Shielding

This new Electro Silv-A-King Uplight fixture brings industrial ceilings out of the shadow and thus improves over-all seeing conditions—and plant appearance. Actual tests have proven this new open-top reflector keeps lamps and reflecting surfaces cleaner longer--thus maintaining a higher lighting level over longer period of time—an important economy.

Available in lifetime porcelain or baked enamel finish.
Fluorescent and Rapid Start: 2 Lamp 4-ft. 40 Watt
4 Lamp (in tandem) 8-ft. 40 Watt
Slimline: 2 Lamp 4-ft. 2 Lamp 6-ft. 2 Lamp 8-ft.



SEND FOR COMPLETE CATALOG

Electro Silv-A-King Corporation

New RLM Specifications for:

1. ALL-WHITE PORCELAIN ENAMEL REFLECTORS (Inside and Outside)
2. INCREASED UPWARD LIGHT
3. MAXIMUM BRIGHTNESS
4. BETTER SHIELDING ANGLES
5. HIGHER REFLECTION FACTORS*
6. HIGHER LIGHT OUTPUT°
7. CAPTIVE LATCHING and HOLDING DEVICE
8. GROUNDED BALLAST MOUNTING
9. CHANNEL DESIGNED for SLIDING HANGERS
10. REVISED LAMP SPACING
11. IMPROVED LAMPHOLDERS
12. ENTIRE UNIT RUST-PROOFED

RLM STANDARDS INSTITUTE

24 FLUORESCENT UNITS

	DIRECT	SEMI-DIRECT	TOTALLY DIRECT
1	Yes	Yes	Optional
2	5%-15%	20%-30%	None
3	Yes	Yes	
4	13°-14°	27°	13°-14°
5	85%	85%	85%
6	83%	77%	80%
7	Yes	Yes	Yes
8	Yes	Yes	Yes
9	Yes	Yes	Yes
10	5"		5"
11	Yes	Yes	Yes
12	Yes	Yes	Yes

22 INCANDESCENT UNITS

*—85%

°—new range from 63% to 80%

NEW RLM SPECIFICATIONS

a new contribution to illuminating engineering progress with 12 ADVANCEMENTS IN INDUSTRIAL LIGHTING!

Both fluorescent and incandescent RLM Specifications for 1955 include important improvements. In step with illuminating engineering progress, RLM Standards take recognition of industry's ever-increasing demand for more light, both on working surfaces and ceilings; better shielding; increased efficiency; easier and lower-cost maintenance.

In addition to the 12 advancements listed here, there are many other important revisions in the new RLM Specifications. These changes bring advantages that make specifying units bearing the RLM Label more important than ever!

A complete compilation of all new RLM Specifications covering 46 different types and sizes of incandescent and fluorescent industrial lighting units, may be found in the new 1955 RLM Specifications Book.

Included are the names and addresses of RLM participating manufacturers who make one or more lighting units bearing the RLM Label. For your complimentary copy, sent without obligation, please address your request on your company letterhead to:

RLM Standards Institute, Suite 823, 326 W. Madison St., Chicago 6, Ill.

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They fit easily into any block or tile opening. For 2, 3, 4, and 6 lamps.

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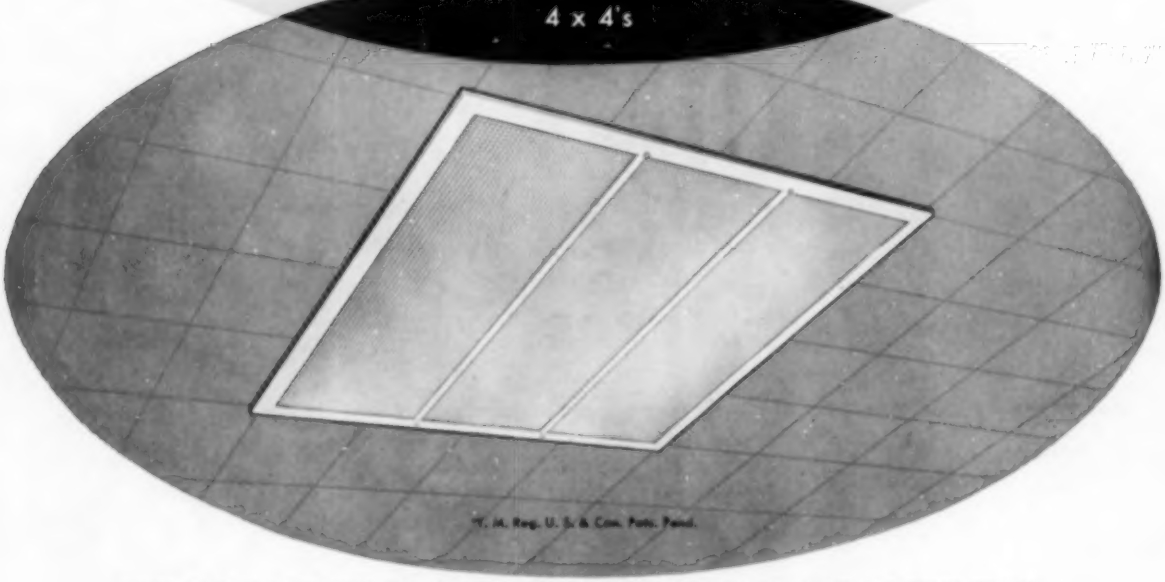
4 x 4's



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